An agroecological analysis of the adaptations of resource poor rice farmers from a Philippine barangay

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Statement of Originality

This thesis is entirely the work of the author except where due acknowledgement is made.

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Abstract

The search for more sustainable modes of agricultural production is one of the greatest challenges facing the modern world. Agroecologists suggest that sustainable modes of production must adopt ecological principles and restore and reinvigorate agricultural communities. Using an agroecological framework, this thesis explores the possibilities for sustainable adaptations amongst resource poor rice farmers from the Philippine barangay (village) of Campagao. The thesis explores the adaptations of Campagao's rice farmers over the last thirty years, a period which saw substantial changes in agricultural practice within the barangay. Using a reinvented agroecological approach that emphasises the importance of linking ecological and social systems, and dealing directly with the political, social and epistemological barriers to sustainable agricultural production, this thesis reviews the possibilities open to resource poor rice farmers in the Philippines. The thesis suggests that the agroecological approach needs to focus more on the development of persistent, enabling social mechanisms that support ecologically-informed practices, and that encourage new, locally renewable practices. The thesis suggests how this may occur within the context of the Philippines.

Glossary of Bol-anon terms

Bol-Anon	Definition
Abuno	Fertiliser
Abunoaey	From Abuno, means 'to add something' in this case money into a cooperative money raising venture, this money may then be loaned out at interest for capital build up.
Agusan	Traditional rice variety
Ahito	A repellent plant
Ajon-Ajon	Cooperative labour: a labour exchange agreement between 2 individuals; from root word ajon- 'to go with', so when repeated 'you go with me I go with you'
Amutan	A repellent plant
Bagakay	A repellent plant
Balo-Balo	The practice of exchanging rice
Banti	A repellent plant
Baow	Upland area
Barangay	The smallest government administrative unit in the Philippines (a village)
Basbason	Sandy soil from Campagao that may include river sand and pebbles, bas means sandy- sandy loam
Bijaay	Type of but for rice only, old Campagao social organisation
Bukasi	A type of locally produced organic fertiliser
Carabao	A water buffalo used for land preparation
Carosa	Carabao cart
Cavan	25 gantas of unmilled rice; or 3 panigahans of unmilled rice; the weight varies depending on the type of variety-usually between 36 and 42 kilos
Civac	Citizens Voluntary Action: acronym introduced during the Marco era, used now as a verb to mean cooperating to clean an area, such as a purok, elementary school etc
Dayong	A funerary association
Daro	Ploughing, plough
Engkanto	Nature spirits appeased by patilow ritual
Gabi-Gabi	A herbaceous plant
Ganta	A unit of measurement, 25 to one cavan
Garab	Knife used to harvest rice
Golden Kuhol	Snail infesting rice paddies
Guano sa buho	Bat dung fertiliser
Hagbas	Brushing and cleaning dykes
Humay	Unmilled rice
Hungos-Hungos	Cooperative labour: a labour exchange agreement between a group of people; means 'going together'
Ihaw-Ihaw	Meat vending, raising money through slaughtering a pig or Carabao; ihaw refers to the act of butchering: when a term is repeated as in ihaw-ihaw or ripa-ripa, this means that it is a reoccurring event for example saying 'ihaw' is just to butcher, but 'ihaw-ihaw' is to periodically butcher to raise money
Ipil-Ipil	Local plant used for compost, nitrogen fixing tree
Kagawad	Barangay councillors
Kahig	Levelling, level
Kaingin	Rotating swidden agriculture
Kainte	Traditional rice variety

Kamot	Weeding
Kanumay	Repellent plant
Katungganon	Black, deep soil in Campagao; from the root word katunggan which means mangrove: mangrove like soil
Kawitan	Clan
Kinaraan	Traditional agriculture: comes from the root word karaan which means 'old', but refers to things only not people
Lempi tadan	Preparing seedbed
Lubang	Traditional rice variety
Lupon	Barangay magistracy
Madre de Cacao	Legume used for compost
Minag soon	An indigenous organisation that is usually family/clan based and resembles both the gala and the dayong; comes from the root word Igsoong 'brotherly/sisterly'
Nang	A term of respect used when addressing an older woman
Nong	A term of respect used when addressing an older man
Nigo	Bamboo basket used for winnowing
Pakyao	Fixed rent on a rice paddy that must be paid each and every season regardless of harvest (eg 4 sacks); also refers to any contract where the price is fixed: eg, brushing a rice paddy for p500.
Panganahaw	Traditional rice variety
Panuig	June-August planting season
Panolilang	October-December planting season
Patilow	Rice harvest ritual
Pigis	Roller used in traditional method of land preparation
Pijangaw	Insect (Rice bug)
Piligahan	1/3rd of a cavan
Pilit	Glutinous rice variety
Pito-Pito	1/7th of the harvest
Prenda	To pawn something for money (including land)
Purok	A small geographical area within a barangay, a collection of households
Ripa-Ripa	Lottery
Salmon	6 to one ganta- is actually a salmon fish tin
Sari-Sari	A local store
Sibocao	A repellent plant
Sipak	Rice plant tillers or tillering
Sitio	Another name for purok
Sohong	Mole cricket
Sudlay	Harrowing
Tagbak	A repellent plant
Tahop	Literally means rice hull, verb tahop means to separate grain from hull
Taloon	Brown, waxy soil in Campagao; from the root word talo- which refers to bees wax
Tanod	Barangay police
Timbaw	Making dykes
Tuba	Wine made from the sap of the coconut flower
Tungro	A viral disease of rice plants
Tuslo	Dipping rice seedlings in fertiliser prior to transplanting (also referred to as 'starting'
Utang na loob	A feeling of reciprocity
Verada	One share in the above

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1. Introduction

The development of more sustainable agricultural systems is one of the greatest challenges facing the modern world (FAO, 2002). The need to reduce the environmental effects of agricultural production at the same time as meeting increasing demand for food is an urgent task. While some argue that the industrialised world can continue to meet global demand through increased efficiencies in high input agriculture (Avery, 1995) others suggest that this is not sufficient, or even desirable, and that the challenge of developing more sustainable agricultural systems is becoming ever more urgent with the increasing environmental impacts of agricultural production and the ongoing degradation of the agricultural resource base (Pretty, 1995; Uphoff, 2002). In the so-called 'developing' world, where agricultural systems range from traditional, low input types to the technologies and practices of the green revolution, a number of deleterious impacts have been recognised. These range from local environmental problems such as biodiversity loss and desertification, to economic and social problems which stem from elements of the social and economic systems within which agricultural production is embedded (Pretty, 1995).

Throughout the 'developed' and 'developing' worlds, there is recognition that the negative social and environmental impacts of all agricultural systems need to be addressed. Governments, NGOs, environmentalists, global institutions and transnational corporations are all calling for more sustainable agricultural systems. Not unlike 'sustainable development', 'sustainable agriculture' has come to mean many things to many people, and there exist many interpretations of the term. For some -- particularly those who promote alternative, low input agricultures -- a sustainable agriculture is one that optimises production within ecological constraints, and restores and reinvigorates both the agricultural resource base and the agricultural communities that rely upon that resource base for their livelihoods (Pretty, 1995; Röling and Wagemakers, 1998; Uphoff, 2002). This is the view of sustainable agriculture adopted in this thesis. Within this view an emphasis is placed on agroecological farming practices, i.e. practices that as far as possible mimic ecological processes and services (see Altieri, 1995; Gliessman, 1998) (I will discuss this view at length in chapter 3). An alternative perspective suggests that the move towards sustainability will be facilitated by the "gene technology, ecotechnology and information and communication revolutions" (Swaminathan, 2000:28). It is argued that "these three types of advances, when coupled with improvements in management and governance, greatly increase the power of a scientific approach to genetic improvement, management of natural resources and ecosystems, and local and regional development strategies" (Swaminathan 2000:28). This technocentric approach to agricultural development is an approach favoured by many nations throughout the world.

Thus, "sustainable agriculture" is a contested term and a problematic one for a number of reasons -- not the least of which is the difficulty associated with defining a sustainable agricultural system. For example, it is unreasonable to assume that an agricultural system that may be sustainable in the present context will necessarily be sustainable under future conditions. Related to this issue are the significant problems associated with indicators of sustainability – the complexity of agricultural production coupled with the complexity of food distribution systems, and the broader social, economic and political structures within which agricultural production takes place make it very difficult to quantifiably assert that a particular agricultural system is sustainable. Thus the task of the sustainable agriculture analyst is not to quantify the sustainability or otherwise of particular agricultural systems for all time, but to investigate the eco-social conditions within which more sustainable agricultural systems may arise. Indeed, this is one of the central concerns of this thesis. In this context I think it is useful to think of agricultural systems as existing along a continuum, from more sustainable to less sustainable, rather than a set of polar opposites, i.e. sustainable and unsustainable.

At the least sustainable end of the continuum we have those types of agricultural systems that are industrial in scope; these have significant environmental impacts, and their reliance on non-renewable resources make them inherently unsustainable. Next along the continuum we have the green revolution agricultural systems used by millions of farmers in the 'developing' world; these also cause significant environmental problems and they also rely upon non-renewable resources. At the more sustainable end of the continuum are the traditional agricultural systems which have existed for thousands of years, which, we can assume from their longevity, have many sustainable characteristics. These systems typically use local, renewable resources efficiently and do not rely on external inputs. Dotted along the continuum, between these archetypes, we have the thousands of hybrid agricultural systems which constitute the vast majority of agricultural modes in the 'developing' world.

In the last 35 years there has been much focus within developing countries on replacing traditional, low input rice production systems with the green revolution system of rice production; this was particularly the case in Southeast Asia. In the Philippines -- the birthplace of the green revolution -- this transformation was ubiquitous in the more favourable rice growing regions, and elements of it were also used widely throughout the less favourable areas. This transformation led to significant increases in yield, but has also been accompanied by a number of sustainability problems, including a significant reduction in rice plant genetic diversity, problems with pest resistance and resurgence, a decrease in yield potential over time, and many social and economic problems arising from the use of a high input mode of production by resource poor farmers. These issues will be discussed throughout this thesis. This thesis will suggest that many of the problems accompanying the green revolution resulted from its technocratic focus. Technical solutions to sustainability problems continue to dominate the agricultural development agenda in the Philippines, as is evidenced by the spread of the latest biotechnological products to the Philippines and the government's focus on promoting high yielding hybrid rice varieties.

This thesis will suggest that the focus on technology, and the accompanying belief that technology will solve agricultural problems, has meant that not enough emphasis has been placed on ascertaining the ways in which the dominant political, economic and social structures, at various scales, prevent the widespread adoption of more sustainable agricultural systems. The central assertion of this thesis is that ecologically informed technologies are a necessary but not sufficient condition for sustainability. The purpose of this thesis then is to uncover the necessary *and* sufficient conditions for sustainability within the context of resource poor rice farmers from the Philippines.

Resource poor farmers are those who suffer from a lack of access to natural, social, physical, human and economic capital, including some or all of these. For example, they may farm small plots of marginal land, they may have very small cash incomes, and they may lack access to the types of social capital and knowledge required to improve the sustainability of their agricultural systems. Typically these farmers are marginalised by dominant political structures; they may live in areas of conflict, and in general they are vulnerable physically, economically and socially.

While there is worldwide recognition that many agricultural practices require transformation, such transformations are difficult for farmers who face resource constraints. There are a number of social, epistemological and political barriers to the local realisation of such practices, and these constraints need to be defined and transformed if the enabling conditions for sustainable practice are to be met. This concern frames the primary research question of this thesis:

What are the necessary and sufficient conditions for the development of more sustainable agricultural systems amongst resource poor rice farmers in the Philippines?

This thesis will suggest that sustainable agricultural development consists of two parallel and mutually reinforcing aspects: at one level there is the actual practice of local farmers – i.e. what do they do and how do they do it; however, there also exists another level – a transformatory level, wherein action to transform the conditions which inhibit the local realisation of sustainability takes place. In order to understand how agricultural practices can be transformed, not only do we need an appreciation of the local social, political and economic context within which these practices are embedded, but we also need to understand the ways in which farmers use the resources available to them. This leads to the secondary research question of this thesis, namely:

How have resource poor rice farmers from the Philippines adapted to agricultural development interventions in practice?

This thesis will address these two research questions through an analysis of the rice farming adaptations of resource poor farmers from the Philippine barangay (village) of Campagao on the island of Bohol. In the last 30 years these farmers have faced extraordinary agricultural change, when their traditional system of rice production was replaced by green revolution technology. The recent introduction of a local sustainable agricultural initiative has caused further changes within the barangay. This thesis will document the changes in agronomic practices witnessed over time while analysing the social, economic and political contexts within which these practices were, and are, embedded. Then, having analysed the strategies employed by resource poor farmers to adapt to change, this thesis will discuss the necessary and sufficient conditions for more sustainable rice production in the barangay.

1.1 The structure of the thesis

In chapter 2, I will introduce the theoretical perspective of human ecology that has influenced my thinking about this topic, and the methodology (phronesis) that has provided the organisational framework for the research. I will explicate how these two are linked, and how phronesis is an important tool for value-driven research. To conclude this chapter I will discuss the methods employed during my fieldwork, and the tools used to analysis the empirical material.

In chapter 3, I will discuss some of the sustainability problems associated with high input rice farming systems, as well as introducing the concept of agroecology, which is the primary analytical concept of this thesis. I will discuss agroecology's central concerns, and I will argue that through focussing on sustainable production methods, agroecology has lost some of its social-transformative focus. I will suggest that agroecology is an essential concept for sustainable agriculture, but that it needs to rediscover its social transformative capacity if it is to tackle some of the more intractable political, economic and social conditions that inhibit the development of more sustainable agricultural systems.

In chapter 4, I will discuss how agroecology may do this. I will discuss the social, power and knowledge dimensions of agricultural development, and how these dimensions are currently conceived of within mainstream agricultural development, and moreover how they could be incorporated into a more socially-transformative agroecology through the concepts of transformative participatory development, context dependent social capital, and subaltern knowledge.

In chapter 5, I will introduce the reader to the Philippine context. I will discuss how the resource poor Filipino farmer has been marginalised politically, economically and ideologically by the agricultural development initiatives of the National Government of the Philippines (NGP), and I will discuss the political, social and economic conditions which prevailed during the green revolution, and the consequences of these conditions. Included will be a detailed discussion of the agrarian reform programs of the NGP. I will also discuss the nature of politics in the Philippines, and the strong patrimonial ties that permeate social relations.

In chapter 6, I will introduce the island of Bohol and the barangay of Campagao. I will briefly describe the geography and economy of Bohol before moving on to discuss the physical environment in Campagao, the economic livelihoods of those who live there and the social institutions that form such an important part of life in the barangay.

In chapter 7, I will introduce the traditional rice production practices of the farmers of Campagao, and I will describe how Campagao's farmers reacted, in practice, to the green revolution. I will focus in particular on the agronomic changes, how these changes occurred, and how certain social institutions and practices were modified by the green revolution.

In chapter 8, I will discuss the contemporary agricultural development initiatives affecting rice production in the barangay, and in particular the work being carried out by the Southeast Asian Regional Initiative for Community Empowerment (SEARICE), through their Community Development and Biodiversity Conservation (CDBC) program. I will discuss the role of the local farmers association – the Campagao Farmers Production and Research Association (CFPRA) – in this program, the successes and failures of certain aspects of the program, and the socially transformative potential of the partnership.

In chapter 9, I will discuss the post green revolution adaptations of the farmers of Campagao as witnessed during my fieldwork in 2002. I will discuss the land tenure regimes and physical farm characteristics of Campagao's farmers, as well as the management of rice plant genetic material, and the diversity of land preparation, transplanting, fertilisation, pest and disease management, harvest and post harvest strategies of Campagao's farmers. To conclude I will discuss the adaptations of four very different farming families. These case studies will highlight the heterogeneity of adaptations within the barangay and the variability in resources between farmers.

In chapter 10, I will discuss the eco-social adaptations of Campagao's resource poor farmers over the last 30 years, with particular reference to the agroecosystem properties of productivity, stability and sustainability introduced in chapter 3. Addressing the secondary research question of this thesis, I will discuss how Campagao's farmers adapted to agroecosystem changes through the utilisation of social and human capital, and how we might expect resource poor farmers to react to agricultural development interventions that place economic and agronomic pressure on them. With reference to the primary research question of this thesis I will discuss the necessary conditions for the sustainability of rice farming in the barangay, i.e. the agroecological practices needed to make rice farming in Campagao more sustainable.

In chapter 11 – the concluding chapter – I will reintroduce the transformative concepts introduced in chapter 4, and discuss the political, social and knowledge-based conditions that will require transformation if agroecological practices are to be locally realised; I will then suggest how this process might begin. In particular, I will focus on the importance of participatory citizenship, the need to use the institutions that farmers already control to make transformative changes, and the need to link, rather than separate, local social and ecological systems. I will also discuss the importance of the development of critical reflection towards the conditions that inhibit more sustainable practices, and the importance of individual and collective empowerment.

2. Human ecological investigation

2.1 The human ecological perspective

As the discussion of the research problem above suggests, agricultural sustainability problems are multifaceted. They are characterised by environmental, economic, political and social dimensions that embody systems level complexity. Sustainability problems are also normative in nature, as they ask questions about what is best for humanity, what weight should be placed on certain system elements, and, in particular, how we should farm. To analyse these problems, one needs to adopt a theoretical perspective that can make sense of this complexity, while acknowledging the normative position of the sustainable agricultural researcher. One such perspective is human ecology.

Before introducing the human ecological perspective adopted in this thesis, it is helpful to briefly describe the evolution of human ecological thought and the multitude of perspectives that are classified as human ecology. The evolution of human ecological thought can be categorised into two distinct periods, firstly, classical human ecology, which arose most notably within the disciplines of sociology (e.g. Park and Burgess, 1921; Park, 1936), geography (e.g. Barrows, 1923) and social anthropology (e.g. Forde, 1934), and was characterised by the adoption of ecological/biological concepts as explanatory mechanisms within those disciplines. For example, Park (1936) appropriated ecological concepts such as competition, succession, web of life and mutual interdependence when describing the development of urban complexes in the United States of America. During this period, human ecology had what has been referred to as a monodisciplinary perspective (Tengström, 1985), in that there was no attempt at collaboration between the respective disciplines.

With the rise of ecological consciousness in the 1960s and the increased recognition of the complexity of ecological problems and the inadequacy of reductionist thought patterns in dealing with those problems, human ecology took on a more multidisciplinary perspective; it also adopted an action-orientated dimension (Tengström, 1985). Human ecology was now seen to have a mission, and that mission, according to Sörlin (1986:4) was to "let all concerned scientists join in the efforts to establish healthier relations between society and the natural environment". These efforts included the production of anthologies that focussed on particular environmental problems from different disciplinary perspectives (Tengström, 1985).

However, in order to truly appreciate the complexity of human-ecological interactions, there has existed in the human ecological literature for some time a call for the development of transdisciplinary, or metadisciplinary, human ecological perspectives (see Borden, 1985; Tengström, 1985; Young, 1989), and several perspectives or frameworks have been developed (see Boyden, 1986; and Young, 1989). However, there remains no definitive human ecological perspective but a series of concepts that inform one's own perspective. A discussion of the elements of human ecological thought that have informed my own theoretical perspective follows.

One of the most important elements of human ecology is the recognition that human beings, other beings and the environment exist within complex systems, and as such the human interaction in that system needs to be considered (Young, 1989). A number of human ecological models have been developed that attempt to delineate the nature of these interactions. These models typically have a biological or a social orientation (Glaser, 1995). Biologically oriented models may focus on phenomenon such as energy or nutrient flow (see Worthington, 1973; Newcombe 1975, 1977), and commonly represent human beings as passive variables (Glaser, 1995).

Conversely, socially oriented models place as much emphasis on human factors (e.g. history, demography, social organisation, biophysic state and culture), as they do on biophysical factors (for example, Boyden, 1981; Philips-Howard, 1985). Although these models are socially oriented they in no way discount the importance of an ecosystems perspective. In socially orientated models, humans, their impacts on the environment, and their ability to change it are of primary concern. As such, Glaser (1995) suggests that socially oriented models represent human ecological relationships more thoroughly than biologically oriented models. It is this view of human ecology that is followed in this thesis; in my opinion, a human ecology without a social orientation resembles nothing more than a type of ecological structural functionalism, and as such cannot be considered representative of human - environment relationships.

Another important aspect of human ecology is its action orientation, i.e. its call for social transformation towards sustainability. This study and indeed all human ecological investigations are, this thesis suggests, normative studies. For instance, once the nature of a human-ecological relationship has been delineated, human ecologists set about outlining the problems with this relationship, how human actions are affecting nature's integrity, how human ecological systems can become more sustainable, and how particular human interactions drive social inequality. Human ecology "holds that there are limits to the capacity of the biophysical and ecological processes on which all life depends and that human societies require transformation if we are to survive" (Russell, 1996:27).

The third element of human ecology, which I consider vitally important, is the need to link social and ecological systems. Within the field of natural resource management, some of the clearest examples of this focus have been developed by Berkes and Folke (1998), in their "Linking Social and Ecological Systems" (LSES) approach. LSES seeks to integrate a systems approach with adaptive management, institutional analysis and property rights. The aim of the LSES approach is to study the interdependence of social and ecological systems in order to:

1. Ascertain how local social systems have developed management practices based on ecological knowledge for dealing with the dynamics of the ecosystem(s) in which they are located; and
2. Discover the social mechanisms behind these management practices.

The authors contend that with this information, resilient and sustainable resource management systems can be developed. Within this approach there is a focus on learning and adaptive management – which is based on the premise that human understanding of the environment is imperfect and as such human interactions should be experimental. A key principle behind adaptive management is the co-evolution of social and ecological systems through feedback mechanisms, and as such, within this perspective, much emphasis is placed on the development of responsive social institutions and learning. The importance of cultural values is also stressed. Berkes and Folke have developed a series of social mechanisms that they suggest are of universal importance in the search for more sustainability natural resource management systems. These include the revival of local knowledge, the intergenerational transfer of knowledge, taboos and regulations, and social and cultural sanctions.

I agree that social mechanisms such as these may enable social and ecological systems to be better linked, and that concepts such as resilience and adaptive management are good examples of transdisciplinary human ecological concepts. However, I believe that aside from the development of transdisciplinary principles, human ecologists need to focus on how these principles will become operationalised. Within the agricultural systems literature there is a plethora of texts that suggest how we should think about and attempt to solve agricultural problems (e.g. Pretty, 1995; Roling and Wagemakers, 1998; Uphoff, 2002); these typically provide frameworks for moving towards sustainability, and deal with issues such as social capital development, participation and knowledge. While these texts are important, I think much work still needs to be done on the operationalisation of solutions. How is social capital going to be built and mobilized in different contexts? How can farmers participate more effectively? How can their knowledge become as important as the reductionist science discourse? These are issues of social transformation, and it is this social transformation towards sustainability and empowerment that I believe to be a most important element of human ecology. Based on these elements, I define human ecology as a perspective that seeks to transform the social and economic relations and structures which perpetuate injurious relations between humans and humans and between humans and the ecological systems of which they form part.

2.2 Phronetic methodology

From a methodological perspective, human ecology has two defining characteristics. Firstly, there is recognition that different but complementary forms of epistemological perspective are integrated within human ecology (Glaser, 1995). Human ecologists hold that the world is multi-faceted, and comprised of seemingly objective and subjective elements. By adopting a pluralistic perspective, epistemological assumptions that may create barriers to uncovering the mechanisms that perpetuate injurious human ecological relations are overcome. For example, if one is committed to the interpretivist perspective, questions about systemic phenomena would not be asked; or, conversely under a positivist perspective, questions relating to the subjective world would be ignored.

Human ecology also has a critical realist view of reality (Russell, 1996). According to Guba (1990), this is the view that reality exists outside of the mind, but it can never be fully comprehended. Critical realists are concerned with uncovering the generative mechanisms that shape and constrain society; they are critical of the claims to objective truth of positivist science, and they focus on the social causes of social phenomena. For the critical realist, social problems (the human ecologist would also add ecological problems here) arise from social conditions, and therefore the solutions are to be found at the social level (Danermark *et al*, 1997). As such, at a methodological level, this thesis focuses on the actual social practices of farmers and the social responses to agricultural change, as well as the social and economic relations and structures that influence these responses, as it is these social relations and structures that must be transformed if more sustainable agricultural systems are to be developed.

According to Patton, the choice of methodology rests on its appropriateness given "the purpose of the inquiry, the questions being investigated and the resources available" (1990:39). As we have seen, human ecological investigation is the normative exploration of human - nature relationships with a view towards the social transformation of these relationships towards sustainability. Human ecology is also characterized by epistemological pluralism, and a focus on uncovering the complex social factors that shape phenomena. One methodological perspective that I believe is particularly pertinent to human ecological inquiry is phronesis.

In his book *Making Social Science Matter*, Bent Flyvberg (2001) describes the so-called 'science wars' and the attempts by social scientists to mimic positivistic natural scientific enquiry and its so-called context free and predictive characteristics. Flyvberg suggests that social science can never compete with natural science in the realm of predictive, epistemic theory, as its context dependence does not allow for the development of context free laws. Flyvberg suggests that social scientific enquiry is strong exactly where natural science is weak, namely in the "reflexive analysis and discussion of values and interests, which is a prerequisite for the enlightened political, economic and cultural (and I would add sustainable) development of society" (Flyvberg, 2001:3).

Flyvberg suggests that the concept of *phronesis* provides the framework though which discussions about values, interests, and the development of society can take place. According to Flyvberg, Aristotle distinguished between a number of intellectual virtues including *episteme* – which concerns itself with universals and invariable knowledge, i.e. "know why"; *techne* – which focuses on the application of technical knowledge, i.e. "know how", and *phronesis* – which is a type of value rationality or practical wisdom, which Flyvberg defines as "[D]eliberation about values with reference to praxis" (2001: 57).

Flyvberg suggests that phronesis -- or value rationality – has given way to scientific and technical rationality within modern society; this is referred to as the Rationalistic Turn, and is characterized by the "narrowing of modern society's notion of rationality to a predominantly instrumental one" (Flyvberg, 2001: 53). For Aristotle, a well functioning society was dependent on all three of the rationalities described above, and *phronesis* was the most important because "for the possession of a single virtue of prudence [*phronesis*] will carry with it the possession of them all" (Aristotle, 1976). According to Flyvberg, the role of social science should be the furtherance of the notion of *phronesis,* with a view to answering the following four value- rational questions:

1. Where are we going?
2. Is this desirable?
3. What should be done?
4. Who gains and who loses, and by which mechanisms of power?

Flyvberg does not suggest that social scientists – or human ecologists for that matter – will be experienced or wise enough to answer all four of these questions, but what he does expect is an attempt on behalf of phronetic social scientists to "develop partial answers to these questions; such answers would be the input to the ongoing social dialogue about the problems and risks we face and how things may be done differently" (Flyvberg, 2001: 61).

Human ecology, with its concern for social transformation towards sustainability, is in itself a form of phronetic inquiry. Human ecology posits that certain social and economic relations lead to deleterious ecological impacts; it studies the cause of these impacts, questions their desirability, discusses their consequences, and suggests how we may go about ameliorating these deleterious ecological impacts through modifications to human social systems (Glaser, 1995). These are all issues of value rationality. Moreover, human ecology recognises that the answer to human generated problems will only be found in human social practices themselves, as it is through these social practices that our impact on the environment is occasioned. Human ecology is a form of social scientific enquiry that, as well as focusing on social and economic structures and relations, also considers the impact these relations have on the environment. It expands its sphere of value rationality to include human relations with nature.

What then are the guidelines for a phronetic methodology? Flyvberg lists nine such guidelines. The first guideline of phronetic methodology is its focus on values. Within the context of a phronetic study, researchers reject universalism and relativism and instead focus on the socially and historically conditioned context under study – they focus on situational ethics. The point of departure for the phronetic researcher is "their attitude to the situation in the society being studied" (Flyvberg, 2001: 130). As will become clear from the material introduced in chapter 5, and from subsequent discussions in chapters 10 and 11, my attitude to the case study is heavily influenced by a belief that the resource poor farmers I interviewed are marginalized politically, economically, ideologically and socially by the policies of the National Government of the Philippines (NGP), and through their social interactions with others from their immediate social sphere. Indeed, a large part of this thesis is devoted to uncovering the social mechanisms that have led to and that continue to perpetuate this marginalization, and to suggest ways to overcome it.

The second guideline is the placement of power at the core of the analysis. This includes an analysis of: Who gains and loses, and through what kind of power relations? What possibilities are available to change existing power relations? Is it desirable to do so? Of what kind of power relations are those asking these questions themselves a part? An analysis of the power issues that contribute to the marginalisation of resource poor farmers forms a very important part of this thesis. In subsequent chapters I will discuss power as it relates to local political processes, the dominance of certain knowledge over others, the power inherent in certain labour arrangements, and the latent power that rests within resource poor farmers' groups, and social institutions. In chapter 4, I will introduce three social transformative concepts that have issues of power at their core: bracing social capital, transformatory participatory development and subaltern knowledge. In chapter 11, I will discuss these at length, with reference to the empirical material.

The third guideline is getting close to reality. This includes getting close to the phenomenon or group under study during all phases of the research project. The aim here is to develop a situation wherein the subjects of the research, one's peers and any other stakeholders can test and evaluate the research and provide positive and negative feedback, which in turn acts as a learning mechanism for the researcher. The fourth guideline is what has commonly been referred to as 'thick description'. This involves becoming deeply concerned with the minutiae of the phenomena under study. According to Flyvberg "...phronetic research is decentred in its approach, taking its point of departure in local micropractices, searching for the Great within the Small and vice versa" (2001: 134). Related to this is the fifth guideline, which is looking at practice before discourse. Within the phronetic methodology, practice is more fundamental than either discourse or theory. One has to look at actual daily practices, and study the interrelationship of practices, the "horizon of meaning is that of individual practice" (Flyvberg, 2001: 135). Later in this chapter I will discuss the research methods I employed that enabled me to 'get close to the reality' of the rice farmers from Campagao, I will also discuss the rationale that informed my data collection, my concern with thick description, and my focus on analyzing the daily practices of my research subjects.

The sixth guideline for phronetic research is the focus on case studies and contexts. According to Flyvberg "practical rationality and judgement evolve and operate primarily by virtue of deep-going case experiences" (2001: 135). This includes an appreciation of the social and historical contexts of cases. Chapters 5, 6 and 7 of this thesis will introduce the reader to the historical and social context of rice farming in the Philippines, and within the barangay of Campagao in particular. This includes a description of local social institutions, their role in agricultural production, and how they have changed over time. In chapters 7 and 9, I will introduce case studies of individual farming families and their particular responses to agricultural change. This will allow the reader to appreciate the heterogeneity of agricultural adaptations and the varying impact of agricultural policies in different contexts.

The seventh guideline is what Flyvberg calls 'Asking How'. As well as being concerned with the Why question, phronetic researchers are also interested in the How question i.e. they are interested in understanding and explanation. A large proportion of chapters 10 and 11 will be devoted to this 'How' question, particularly when I discuss how the farmers adapted to certain agricultural changes, and how we might learn from this in developing more sustainable rice production systems.

The eighth guideline is the joining of agency and structure. Agency is analyzed in relation to structures and structures are analyzed in terms of agency. There is an acceptance that both are indissolubly intertwined, as Flyvberg states "[P]hronetic researchers deliberately seek out information for answering questions about what structural factors influence individual actions, how these actions are constructed, and their structural consequences" (Flyvberg, 2001: 139). The analysis of structure and agency, and the role both have played in agricultural development within the barangay, will be discussed at length in chapter 11. Particular emphasis will be placed on the role local social institutions may play in the social transformation towards sustainability.

The final guideline of phronetic research is a dialogue with a polyphony of voices. Phronetic researchers do not contend to be final authorities on what they research but see themselves as entering into an expanding social dialogue within society. It is hoped the research undertaken in this thesis, and the suggestions arising from it, will contribute positively to the debate on agricultural sustainability, but most importantly the author hopes it will lead to action on behalf of those with a stake in sustainable agricultural development, be they researchers, farmers or policy makers.

As evidence of the unsustainability of agricultural systems becomes indisputable, and the consequences ever more grave, the questions asked by the phronetic researcher and human ecologist, namely: Where are we going? Is this desirable? What should be done? Who gains and who loses, and by which mechanisms of power? become increasingly necessary. Human ecology demonstrates that humans are vitally important elements of ecological systems – in many systems we are the key species – we have the potential to cause the most damage, and we also have the capacity to fix the problems we have caused. These problems can only be addressed by changing the economic, social and cultural elements of the human systems that cause maladaptation. Phronesis coupled with the human ecological perspective allows us to examine these greater human-ecological issues through an analysis of our societies' interaction with nature. The following chapter will introduce some of these human induced problems as they relate to high input rice production systems in particular, before moving on to discuss how these impacts may be ameliorated through adopting a more ecological approach to agricultural production.

2.3 The research process

As discussed in the previous section, the research approach adopted in this thesis is explicitly normative. Using the theoretical concepts, and normative standpoint that underpins human ecology, guided by a methodological framework (phronesis) that focuses on the primary role of power, and the importance of cases and context, I set about undertaking what can best be described as orientational qualitative research, which, as Patton suggests, "begins with an explicit theoretical or ideological perspective that determines what variables and concepts are most important and how findings will be interpreted" (Patton 1990:85).

The choice to base my research in Campagao, and to focus on the lives of resource poor rice farmers, was largely influenced by my previous experience and knowledge of that village, gained during some earlier research, as well as my long term interest in the sustainability initiatives of resource poor farmers, and the importance of trying to link local social and ecological systems. The institutional richness of the barangay, coupled with the broader agronomic, economic, political and social issues that face rice farmers in the Philippines, provided an appropriate context for a normative study of sustainability issues.

One of the primary motivations driving my research was an attempt to get 'as close to reality' as possible. I wanted to understand – as much as is possible for a western educated researcher – why rice farmers do what they do, and how the local and non-local social, economic and political contexts shape and constrain the actual and possible practices of resource poor farmers. To do this I focussed on thick description, exposing myself as much as possible to the reactions of farmers to my evolving interpretations, and looking at practice before discourse – these are three key components of the phronetic methodology introduced above.

2.3.1 Data collection

The process of data collection was undertaken during a one month period in February, 2002, followed by an eight month period between May and December, 2002. During these nine months I resided in the barangay of Zamora, a short distance from Campagao, and close to the Central Visayas State College of Agriculture, Forestry and Technology (CVSCAFT). My familiarity with Campagao and my long standing friendship with some farmers in the village gave me relatively easy access to a number of willing research participants. Through these friendships I was invited to participate in a number of social events throughout Campagao, which further expanded my circle of acquaintances and provided a number of opportunities for seeking further participation.

Throughout the eight month period I interviewed 51 rice farmers from the barangay. Interviewees included all 26 members of the Campagao Farmers Production and Research Association (CFPRA) (the only farmers' association in Campagao), and 25 non-CFPRA rice farmers. I also interviewed eight key informants including: agricultural extension officers at municipal and provincial levels, NGO coordinators working with CFPRA on an organic farming initiative, a local political activist, and an elderly lady with a deep historical knowledge of the barangay. In total, I conducted 129 separate interviews, and recorded 125 hours of conversation. As my knowledge of Cebuano (the local dialect) was only basic, I was forced to utilise the services of a local interpreter, who was a recent graduate of CVSCAFT.

Were possible I conducted semi structured interviews in the homes of farmers, and I attempted, were applicable, to interview husbands and wives together. Before each interview, I drafted some interview guidelines which detailed what themes I would focus on (e.g. land tenure, experience with the green revolution, associational life, agronomic practices), but these were not followed to the letter, particularly if the discussion was raising some interesting material related to my research purposes. Furthermore, I found that some respondents were very knowledgeable about certain aspects of life in the village, e.g. the function and history of indigenous social institutions, or the characteristics of rice varieties; with these individuals I adopted a much less structured approach, and let the interviews take a more organic form. In line with the thick description approach, I focussed specifically on the little questions, and the local micropractices that constitute daily life in the barangay.

Immediately after the interview process I entered the details of each interview and the topics covered in a excel spreadsheet. I also attempted to transcribe the interview as close as possible to the interview date; however, this became increasingly difficult as the number of interviews increased. After transcribing each interview, I undertook some preliminary, descriptive coding of the topics covered, this was then accompanied by more thorough data analysis using the NVivo software package, as will be explained in the next section.

My interview data was also accompanied by extensive field notes, which included a diary of my daily actions, observations about social and political events, and comments about agronomic practices witnessed in the field. The notes also included observations about phenomena that may have not been directly related to agronomic practice in Campagao, but which helped me try to understand life in the Philippines (e.g. details of the ongoing insurgency in Bohol and throughout the Philippines, the widespread corruption in Philippine public life, the importance of remittances for Philippine families).

The primary research data I collected was also supplemented by secondary research undertaken at a number of relevant local institutions including: Bilar Local Government Unit, the Department of Agrarian Reform (Bilar and Tagbilaran City), the Provincial Government Offices (Tagbilaran City), the Bureau of Agricultural Statistics (Tagbilaran City), and the Agricultural Promotion Centre (Tagbilaran City). These data provided detailed information on socio-economic circumstances, agricultural yield, agrarian reform, and historical and contemporary agricultural development programs.

Throughout the research process, I also attempted to get as much feedback on my research as I could; for example, I attended all the meetings of CFPRA, were I would discuss the progress of my research and some of the preliminary conclusions I had made about the empirical material gathered – the feedback I received from farmers during this forum helped me determine both the trajectory of my research, and its legitimacy.

2.3.2 *Data analysis*

The vast majority of my data analysis took place upon my return to Australia. After having transcribed all my interviews, and my field journal, I used the NVivo qualitative data analysis tool to apply preliminary codes to the data. These preliminary codes compartmentalised the data into subject categories (e.g. methods of land preparation, types of organic fertiliser, social institutions etc). These codes had no conceptual attributes, but were simply codes that helped me organise the data into manageable portions. This proved very helpful during the writing of the more descriptive sections of the thesis, and helped me become very familiar with the minutiae of local agronomic practice and social life in Campagao.

After this exercise in provisional coding, I adopted a more conceptual coding approach, in an attempt to compartmentalise data that had some conceptual or theoretical relativity. Using this approach I produced a number of categories that spanned the data, covering issues such as dependence, knowledge, trust, protest, ritual and belief and social learning. Again, these coding exercises helped me familiarise myself with the data, and the connections across the data. However, while I found NVivo a useful tool as far as categorisation, and data management is concerned, I was unable to exploit its more analytical features, which I found to be unwieldy and unsuited to my need to develop theoretically informed insights. Therefore, after having exploited the data management and categorisation aspects of the NVivo program, I reverted to a much more traditional, theoretically informed approach, where I proceeded to analyse the data in line with the theoretical concepts driving my research. It is to these concepts that this thesis will now turn.

3. Reinventing agroecology

This chapter serves a twofold purpose: the first is to situate the reader within the broader debate on agricultural sustainability, and sustainability issues in rice production in particular; the second is to introduce to the reader the concept of agroecology which will provide the framework for the analysis of the empirical material presented in chapters 10 and 11. In this chapter, I will introduce a tripartite model of agroecology that represents my understanding of the three pillars of agroecology: the agroecosystems perspective, the application of ecological principles to agricultural production at the field/landscape level, and a concern with the transformation of eco-social systems towards sustainability. I will suggest that while the first two elements are strongly represented within the agroecological literature, the third has been largely ignored. And I will further suggest that the failure to fully integrate social transformative concerns within agroecology has been influenced by problems of scale, a tendency towards naturalism and technological solutions to agricultural problems, and the perceived neutrality of 'sustainable' technological solutions.

3.1 The sustainability of high input rice production

Rice is currently the single most important staple crop in the world – over 50% of the world's population rely on rice for up to 80% of their dietary requirements (FAO, 2000). The vast majority of these people live in Asia, where 70% of the world's poor reside (UNDP, 1997). Since the late 1960s, rice production in Asia has undergone a massive transformation and the vast majority of traditional, low input rice production systems have been replaced by modern, high input rice production systems. Throughout much of Asia, traditional rice varieties have been replaced with modern rice varieties; non-renewable, externally sourced fertilisers have replaced renewable, locally sourced fertilisers; and chemical methods of pest control have become widespread. This "green revolution" enabled rice production in Asia to increase by 74% between 1969 and 2003 (FAOSTAT, 2004). The substantial yield increases of the green revolution have been attributed to an increase in rice production area (32%), increased irrigation and the double cropping of rice (25%), more intensive fertiliser application (22%), and from the inherent genetic qualities of modern rice varieties (21%) (IRRI, 1985).

However, since the 1990s, yield growth has decelerated, and there are now concerns over the long-term sustainability of intensive rice cultivation systems (Cassman and Pingali, 1995; FAO, 1997), and the ability of current systems to provide food for the world's growing population (Kundu and Ladha, 1999; Tiongco and Dawe, 2002), particularly considering that the area planted to rice has remained stable since 1980 (Khush, 1996). As the following discussion will suggest, the sustainability and productivity of Asia's high input rice production systems is threatened by its reliance upon non-renewable chemical fertilisers and chemical pesticides, problems with tillage, and the erosion of agricultural biodiversity that has accompanied the green revolution.

The following discussion of the sustainability issues associated with rice production systems in Asia relates primarily to irrigated and rain fed lowland ecologies of rice production; while there are generally considered to be five ecologies of rice production -- irrigated, rain fed lowland, deepwater, upland and tidal wetland -- the irrigated and rain fed lowland ecologies are by far the most widespread throughout Asia (FAO, 2000), and are the ecologies under study in this thesis.

3.1.1 *The impact of nitrogen fertilisation within high input rice production systems*

One of the most significant factors affecting the sustainability and productivity of high input rice production systems is a long term decline in response to nitrogen (N) application (Pingali *et al*, 1998, Kundu and Ladha, 1999). This declining response has been reported in a number of long term field experiments (Flinn and DeDatta, 1984; Cassman and Pingali, 1995), where input levels have remained constant over time. This decline has been attributed to the degradation of the rice resource base (Kundu and Ladha, 1995), particularly the decreased availability of native soil N (Cassman and Pingali, 1995).

A decline in soil N fertility is occasioned when the N removed through production of a rice crop (up to 20 kgs per tonne of rice per hectare) is not replenished through N fertilisation, or through biological nitrogen fixation (BNF) (Kundu and Ladha, 1999). Soil N fertility is gauged by the ability of the soil to provide plants with N in the appropriate form, volume and rate needed for optimum growth (Kundu and Ladha, 1999). However, the maintenance of soil N fertility is not as simple as applying inorganic fertilisers; only 30% - 40% of inorganic N is recovered when broadcast in paddy floodwaters, the remaining nutrients are lost through ammonia volatization, denitrification, leaching and runoff (Kundu and Ladha, 1999). As such, it is essential to ensure soil N fertility is maintained through the important processes of crop residue recycling, the application of other organic residues, and through BNF (Kundu and Ladha, 1999).

3.1.2 *The impact of rice tillage practices*

The availability of N is also affected by the physical properties of the paddy soil. The continuous flooding of many paddy soils, coupled with the intensive, shallow cultivation witnessed throughout Asia, creates unfavourable conditions for the availability of soil and biologically fixed N (Kundu and Ladha, 1999). The continuous flooding and puddling associated with intensive rice cultivation systems reduces the permeability of paddy soils, which affects percolation rates; a slowing of percolation rates restricts the delivery of dissolved oxygen to rice roots, inhibits the dilution of toxic substances in the root zone, and restricts root access to important sources of subsoil N (Kundu and Ladha, 1999). Intensive shallow puddling with a roto-tiller (a very popular means of cultivation in Asia) has been shown to cause reduced yields in rice crops compared to deep cultivation with draught animal traction (Kirchhof *et al*, 2000); and the practice of puddling has also been shown to decrease the nutrients available to dry season crops planted in rotation with rice (So and Ringrose-Voase, 2000), which has significant impacts on those farmers in rain fed areas who are unable to produce two crops of rice per year.

As the above discussion suggests, it is the practice of shallow tillage coupled with the application of inorganic fertiliser that decreases the availability of native soil N, thus affecting the long term fertility of the lowland rice ecosystem. Nitrogen applied in inorganic form is prone to leaching and volatization and therefore does not build up in the soil; the N that is not lost through leaching or volatization is used by the rice plant during the stages of vegetative growth. Due to changes in soil structure occasioned by shallow tillage, and through the minimal application of organic materials, the nutrient holding capacity of paddy soils and the ability of rice plants to extract native soil N from the degraded soil reduces long term soil fertility, and thus the sustainability of the high input rice production system. As such, the very process that enables higher yields in the short term limits those yields in the longer term.

3.1.3 The impact of pesticide use within rice production systems

Aside from a reliance on inorganic fertiliser and mechanical tillage, another important sustainability issue relates to a high reliance on chemical pesticides as the primary means of pest control in high input rice production systems. The intensive rice monoculture of the green revolution created an environment that favoured pests (Pingali and Gerpacio, 1997); and an increase in the visibility of pest attack, coupled with an apprehension of major pest outbreaks, influenced green revolution policy makers to make pesticides easily accessible and affordable at the farm level (Pingali and Roger, 1995). The availability of pesticides, coupled with farmers' apprehension of substantial losses, was enough to encourage the rapid and injudicious use of pesticides by Asian farmers (Rola and Pingali, 1993).

The use of pesticides caused and continues to cause a number of problems that affect the sustainability of high input rice production systems, and the health of farm workers and local populations. Direct contact with pesticides -- many of which are highly hazardous -- has led to high levels of pesticide poisonings throughout Asia (Pretty, 1995). A lack of education about pesticide use, particularly safe spraying techniques, and the impact of pesticides on local ecosystems have contributed to these human health impacts (Pingali and Gerpacio, 1997; Warburton *et al*, 1995).

The injudicious use of pesticides has also contributed to high level pest outbreaks throughout Asia (Pingali and Gerpacio, 1997), most notably in Indonesia, where rice losses totalled over 1 million tonnes in the late 1970's (Kenmore, 1991), and forced the Indonesian government to ban 57 broad spectrum pesticides that where thought to contribute to second generation pest attack (van der Fliert, 1993). Pest outbreaks in the Philippines and Indonesia have been linked to increases in insecticide use (Kenmore *et al*, 1984; Litsinger,1989), which as well as promoting pest resistance, reduces populations of beneficial insects (Pingali and Gerpacio, 1997) which exist at high levels in rice fields with minimal or no insecticide use (Way and Heong, 1994). The injudicious use of pesticides also contaminates ground and surface waters, and can contaminate the food chain through the transmission of pesticide residues (Pingali and Gerpacio, 1997).

3.1.4 *Crop diversity loss in high input rice production systems*

Another key sustainability issue is the loss of agricultural biodiversity that has accompanied the spread of high input rice production, and the spread of Modern Varieties (MVs) in particular. In many countries, the replacement of Traditional Varieties (TVs) with MVs during the green revolution caused a total loss of rice plant genetic diversity. For example, it has been estimated that prior to the green revolution up to 3500 traditional rice varieties existed in the Philippines (Pelagrina, 2000; CDBC, 2001[a]). At least 300 of these varieties have been displaced since the introduction of MVs in the 1960's (Wood *et al*, 2000; Thrupp, 2000). According to David *et al* (1994), by 1986, 97% of the Philippines' irrigated rice land and 99% of its favourable rain fed rice land was planted to MVs. At that time these MVs consisted of 5 - 6 sister lines released by the Philippine Seed Board (Borromeo and Hernandez, 1987). As of the year 2000, 44 MVs and 3 hybrid rice varieties were available to Filipino farmers (Tabien, 2000); this points to a significant contraction of rice plant genetic diversity in the Philippines over the last 30 years. As the data from this thesis will demonstrate, a lack of access to suitable genetic material restricts a farmer's ability to adapt to changing environments and circumstances.

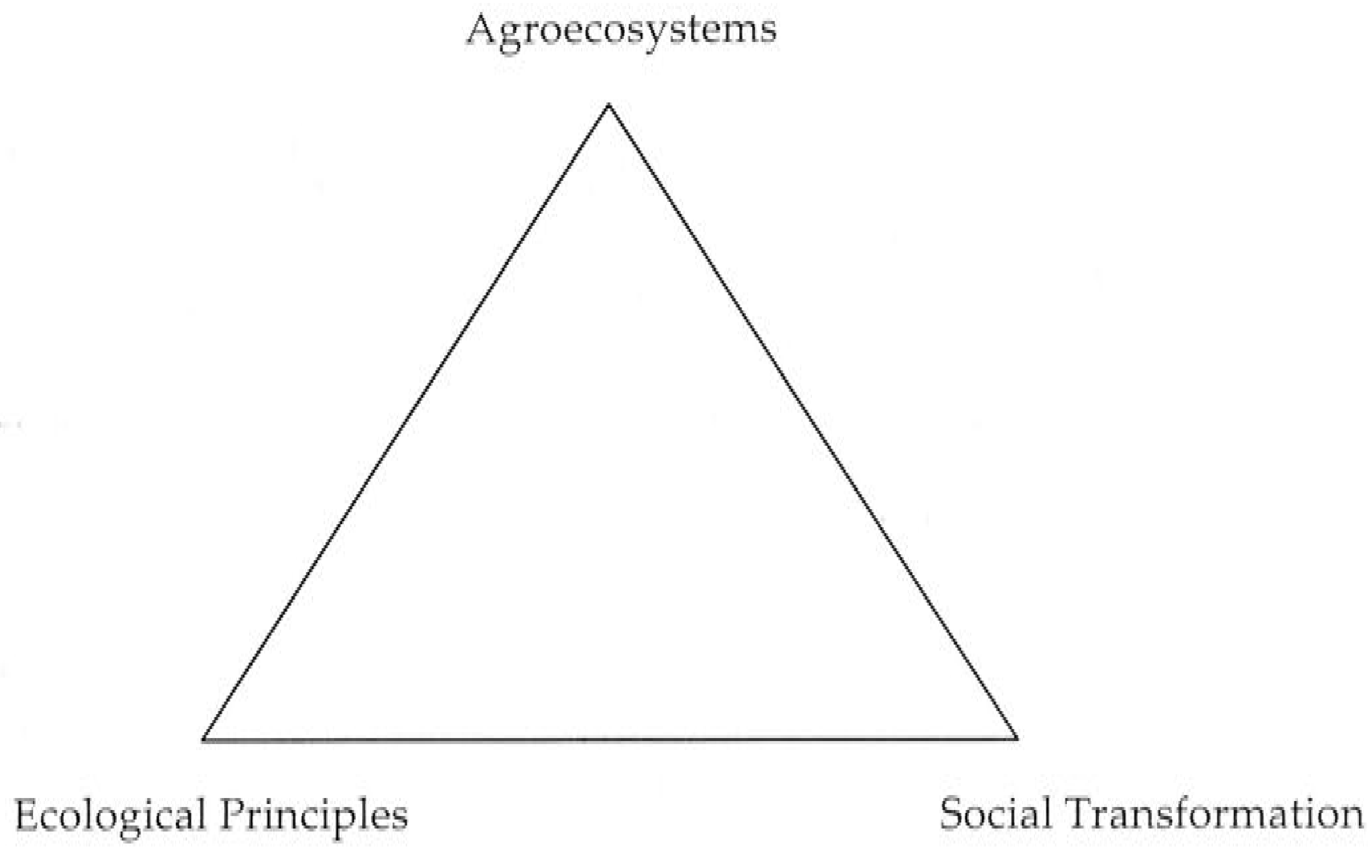
The above discussion suggests that high input rice production systems have inherently unsustainable characteristics. For example the relationship between inorganic N fertilisation and shallow roto-tillage is an example of just one positive feedback mechanism that is inherently unsustainable. More of these unsustainable system level elements will be discussed in chapter 10. The following introduction to the agroecological literature will familiarise the reader further with agricultural system interactions and the sustainability issues associated with them.

3.2 A tripartite model of agroecology

Agroecology is a very difficult concept to define. Its history can be traced back to crop ecology and the integration of agronomic and ecological principles – as early back as the 1930s (Gliessman, 1998). However, conceiving of agroecology as just ecology applied to the agricultural field is a narrow application of the term (Hecht, 1995). Agroecology, as Hecht (1995) suggests, also has broader, more normative applications that incorporate aspects of society that transcend the boundary of the agricultural field. The many influences on agroecological thought, namely -- agronomy, ecology, environmentalism, indigenous production systems, and development studies (Hecht, 1995)-- have produced a very pluralistic perspective, one that is broadly concerned with the transformation of agricultural production systems towards sustainability through the application of ecosystems principles to agriculture (see Conway, 1987 Gliessman, 1990; Carroll *et al*, 1990; Altieri, 1995; Gliessman, 1998; Uphoff, 2002).

This perspective, has, in the opinion of the author, three pillars, or defining characteristics: a systems perspective of agricultural production (the agroecosystem); the application of ecological principles to production at the field/ landscape level; and a concern with social transformation towards sustainability – these pillars of agroecosystems, ecological principles, and social transformation – are represented in figure 3.1.

Figure 3.1 The 3 pillars of agroecology



3.2.1 *The concept of the agroecosystem*

The unit of observation within agroecology is the agroecosystem. An agroecosystem is a human - modified ecological system that comprises plants and animals interacting with the biotic and abiotic environment, (Conway, 1987; Gliessman1998; Altieri, 1995, 2002). The agroecosystem is, however, not limited to the ecological interactions occurring within a field or landscape, because while basic ecological processes such as competition, herbivory, and predation still play a part in the agroecosystem, these processes are regulated by human-agricultural processes, i.e. the human inputs necessary for agricultural production (Conway, 1987). As such, agroecosystems are also comprised of complex socio-economic and cultural factors, and these, alongside certain physical and biological factors, influence the type of agriculture that can be undertaken in a region. Table 3.1 below outlines the agroecosystem determinants that influence modes of agricultural production.

Table 3.1: Physical, Biological, Socio-economic and Cultural determinants that influence agricultural production (after Altieri, 1995)

Determinant	Factor
Physical	solar radiation, temperature, rainfall, water supply (moisture stress), soil conditions, slope, land availability
Biological	insect pests and natural enemies, weed communities, plant and animal diseases, soil biota, background natural vegetation, photosynthetic efficiency, cropping patterns, crop rotation
Socio-economic	population density, social organisation, economics (prices, markets, capital, and credit availability), technical assistance, cultivation implements, degree of commercialisation, labour availability
Cultural	traditional knowledge, beliefs, ideology, gender issues, historical events

Because of the complex ecological and socio-economic aspects of agroecosystems, it is useful to think of these systems as nested within a hierarchy from lower to higher order systems. Conway (1987) suggests that there are numerous levels of agroecosystem, with each agroecosystem forming a component of the agroecosystem above it (Conway, 1987). For example, a single rice plant, and its ecological interactions within the biotic and abiotic environment, could be considered an agroecosystem, this forms a component of the rice field agroecosystem, which includes more complex ecological, and also socio-economic factors; the rice field agroecosystem forms a component of a farming system, which in turn is an aspect of a livelihood system – this continues to regional and national levels, where various agroecosystems are linked by markets, and where national agroecosystems are linked by international trade (Conway, 1987).

Conway (1987) suggests that each agroecosystem, at each level, has a social value. That value is "a function of the amount of goods and services produced by the agroecosystem, their relationship to human needs (or happiness), and their allocation among the human population" (Conway, 1987: 100). The performance of an agroecosystem can be determined by assessing the agroecosystem properties that contribute to the aforementioned social value – Table 3.2 includes details of the four primary properties of agroecosystems.

Table 3.2: The four primary properties of agroecosystems (after Harwood, 1979; Conway, 1985, 1987; Douglass, 1984; Altieri, 1995)

Productivity	A quantitative measure of the output of valued product per unit of resource input, e.g. it may refer to yields, or income per hectare, or some other measure such as, energy input/output, or calories. The resource inputs usually included in the analysis include land, labour and capital. Productivity can be assessed at different agroecosystem levels, and the productivity of different agroecosystems (e.g. corn versus rice), can also be assessed.
Stability	The constancy of productivity in the face of small disturbing forces arising from the normal fluctuations and cycles in the surrounding environment. Including the physical, social and economic variables that lie outside the agroecosystems under consideration.
Sustainability	The ability of the agroecosystem to maintain production through time, in the face of long-term ecological constraints and socio-economic pressures. It also includes the resilience of the system when faced by an acute shock (severe drought, devastating flood), or by intensive stress. Intensive stress includes relatively small, predictable forces that have a cumulative effect, such as indebtedness, salinity, toxicity, erosion, nutrient mining etc.
Equity	The evenness of distribution of the productivity of an agroecosystem amongst producers and consumers. Including meeting reasonable demands for food without increasing the social costs of production, and improving the opportunities and incomes within producing communities.

The properties of agroecosystems will be discussed further in chapters 10 and 11 when I analyse the traditional, green revolution and post green revolution adaptations of Campagao's farmers.

3.2.2 *The application of ecological principles to agricultural production*

Within the agroecological conception, the ecological processes that are found under natural conditions, e.g. nutrient cycling, predator/prey interactions, competition among species, symbiosis and succession, also occur in the agricultural field/landscape (Altieri, 2002). While the agroecosystem has low species diversity compared to natural systems (Odum, 1984), and while it relies upon human inputs (Conway, 1987), these ecological processes nonetheless play a vitally important role in maintaining the productivity, stability and sustainability of these systems (Altieri, 1995; Gliessman, 1998). The goal of the agroecological approach is to optimise and enhance these ecological processes with a view to producing agricultural commodities in a more sustainable way, and with fewer negative environmental and social impacts (Altieri, 2002).

Agroecologists thus concern themselves with designing agroecosystems that, as far as possible, mimic the ecological processes that occur in nature. The ecological processes that are optimised in agroecological systems include: strengthening the 'immune' system of agroecosystems through agricultural biodiversification, decreasing toxicity in the environment, optimising metabolic functioning through the decomposition of organic matter and nutrient cycling, balancing regulatory systems (nutrient cycling, water, energy etc), enhancing the conservation and regeneration of soil, water and biodiversity, and sustaining long term productivity (Altieri, 2002).

Agroecologists argue that ecological processes can be optimised, and more sustainable systems of production can be designed, by applying the five ecological principles detailed in Table 3.3 – these principles will now be discussed.

Table 3.3: Ecological principles for enhancing ecological processes within agroecosystems (after Reijntjes *et al*, 1992, Altieri, 1995; Altieri and Nicholls, 1999)

Secure favourable soil conditions: through the management of organic matter, through conservative tillage practices, and by enhancing soil life
Optimise nutrient availability and cycling: through nitrogen fixation, nutrient pumping, limiting nutrient losses, recycling nutrients, and using complementary external fertilisers
Manage flows of water, air and solar radiation: through microclimate management, water management and erosion control
Diversify species and genetic resources over time and space: through the exploitation of plant/plant, and plant/animal interaction, and animal/animal interactions; intercropping; exploit indigenous plants and resources; introduce new seeds and breeds
Enhance beneficial biological interactions and synergies: through increasing biodiversification of associated organisms within agroecosystems

3.2.2.1 Soil management

The soil profile, and the microbial activity that takes place within it, is considered a particularly important resource within the agroecological view. Within this view, below ground soil microbial activity, i.e. soil ecology, is just as important as soil chemistry or soil physics – the two most common research focuses of soil scientists

(Fernandes *et al*, 2002). Soil is not viewed as something from which to extract a harvest, or something that simply holds up plants, but as something that is of integral importance to the sustainability of agroecosystems (Gliessman, 1998).

Agroecology promotes soil management techniques that maintain or enhance key soil characteristics such as soil fertility, structure, and ecology (see Altieri, 1995; Gliessman, 1998). Fundamental to this is the appropriate management of soil organic matter. Practices that maintain or increase organic matter content in the soil are key aspects of agroecological systems (e.g. the incorporation of crop residues, cover cropping, manure and compost applications) (Altieri, 1995; Magdoff, 1995; Gliessman, 1998). Tillage practices that enhance soil fertility, structure and ecology, and prevent soil erosion, are also important components of agroecological soil management (e.g. no tillage and minimum tillage systems) (Altieri, 1995). A healthy soil profile provides a plethora of ecological processes and services that are integral to the sustainability of an agroecosystem. Aside from the provision of nutrients and water, healthy soils, rich in organic matter, and with high microbial activity, tend to produce healthier plants that are less susceptible to pest damage, as well as providing a less hostile pest environment for crop plants (Magdoff, 1995).

3.2.2.2 Nutrient cycling

Complementary to soil management, the ecological principle of nutrient cycling is another integral aspect of agroecosystem management. Unlike natural ecosystems that use available nutrients very efficiently (Odum, 1984), agroecosystems exhibit very minimal nutrient cycling capabilities (Gliessman, 1998). The nutrient cycling and nutrient availability of agroecosystems can be improved by minimising nutrient losses through the recycling of organic materials, and through cultural management techniques that reduce nutrient leaching and volatization (Reijntjes *et al*, 1992; Altieri, 1995; Gliessman, 1998). The use of cover crops (Magdoff, 1995) crop rotations (Altieri, 1995), and polycultures/intercropping (Liebman, 1995; Amador and Gliessman, 1990), are good examples of agroecological techniques that are used to tighten nutrient cycling within agroecosystems. Nutrient losses can also be minimised by improving the efficiency of crop plant nutrient use through plant breeding, and by developing increasingly more efficient modes of nutrient application (Pretty, 1995).

Nutrient cycling and availability is also increased by capturing on-farm nutrients through the promotion of beneficial plant/micro-organism interactions, such as the use of nitrogen fixing bacteria and mychorrhizal associations (Altieri, 1995); and through the promotion of nutrient 'pumping', e.g. using green manures to bring nutrients from deeper soil layers, or less soluble nutrients into circulation (Reijntjes *et al*, 1992). As the above discussion suggests, the agroecological approach focuses on the utilisation of farm based inputs, and the minimisation of external inputs into the farming system. When suitable nutrients cannot be sourced from the farming system itself, nutrients produced in a renewable manner, such as animal manure and compost from other farming systems, are the preferred nutrient supplements (Reijntjes *et al*, 1992). Agroecology does not exclude the use of external inputs, but suggests that external inputs must be assessed for their long-term environmental and economic benefits (Altieri, 2002).

3.2.2.3 Ecological adaptability and microclimate management

Another ecological principle of central importance to the agroecological view is the extent to which flows of water, solar radiation and air are managed to optimise plant growth. The agroecological perspective promotes practices that, as far as possible, match the light, temperature, water and humidity needs of plants with the climatic conditions within the agroecosystem; it also promotes practices that allow farmers to manage microclimatic conditions by changing the spatial composition and structure of plants and soil cover within agroecosystems (Reijntjes *et al*, 1992). Water management techniques that increase the availability of water while reducing evapotranspiration and ameliorating salt build up are important in this regard (Gliessman, 1998). While practices that manipulate solar radiation to optimise plant growth, such as the provision of shading, multistorey cropping, increasing or decreasing the surface absorption of radiation etc (see Stigter, 1987) are also key aspects of agroecosystem design. While water, air and solar flows must be optimised for plant growth, their damaging effects must also be managed to combat soil erosion, wind and rain damage to plants, and to regulate soil temperature and humidity (Stigter, 1987).

3.2.2.4 Enhancing the genetic resource base

Maintaining the diversity of the genetic resource base is another key agroecological principle. A diverse crop plant and animal genetic resource base provides farmers with the basic resources necessary to create farming systems that suit prevailing ecological and socio-economic conditions. Diversity within farming systems can be enhanced through the understanding and manipulation of the interactions between crop plants, between crop plants and animals, and between animals within the agroecosystem (Reijntjes *et al*, 1992).

Plant/Plant interactions can be manipulated in space (e.g. planting densities, patterns and spatial arrangements), and in time (e.g. planting dates, crop rotations, fertilisation) in order to optimise the use of inputs, while providing the necessary socio-economic outcomes (Reijntjes *et al*, 1992). Techniques such as intercropping, strip cropping, cover cropping and crop rotation can be used to increase diversity in both spatial and temporal dimensions (Gliessman, 1998). Intercropping systems, in particular, have been shown to increase land use efficiency, better exploit soil and water resources, reduce insect pest occurrence, inhibit weed growth and increase yields over monocultures (Amador and Gliessman, 1990; Vandermeer, 1990; Liebman, 1995).

The enhancement of plant/animal interactions is also an important aspect of the agroecological perspective. These interactions can reduce the weeds present in agroecosystems, promote natural regeneration through disturbance, provide sources of fertiliser, and provide important sources of food, particularly protein – as in the rice/fish culture of Southeast Asia (Reijntjes *et al*, 1992; Pretty, 1995; Savory, 1999).

The genetic diversity within agroecosystems can also be enhanced by exploiting the plants and animals indigenous to an area; these resources are, in many cases, very important sources of nutrition for many farmers throughout the world, particularly during difficult periods (Reijntjes *et al*, 1992). The genetic diversity of agroecosystems can also be supplemented by the introduction of new crop plant and animal genetic resources that are suited to the socio-economic and ecological conditions of the agroecosystem in question (Reijntjes *et al*, 1992).

In the case of crop plants, it is important to ensure that any material introduced to marginal agroecosystems be bred for yield stability under a wide range of environments, as opposed to maximum yield under a prescribed environment (Weiner, 1990). These so-called 'low input ideotypes' must be suited to the low input strategies employed by farmers in trying ecological and economic conditions (Janssens *et al*, 1990). While the introduction of new material is usually occasioned through government agricultural development programs, the selection and breeding of crop plant varieties by farmers themselves is now recognised as a very important contributor to the enhancement of crop plant genetic diversity (Witcombe and Joshi, 1997; Cleveland and Murray, 1997; Yap, 2000) , as is the *in situ* maintenance of so-called traditional varieties (Vaughan and Chang, 1992; FAO, 1996; Bellon, 1997; Qualset *et al*, 1997; Cromwell, 1999; Fujisaka, 1999; Thrupp, 2000; Zhu *et al*, 2003). The importance of new planting material and low input ideotypes in particular will be discussed at length in this thesis.

3.2.2.5 Enhancing associated biodiversity

Aside from the enhancement of the crop plant or animal genetic resource base, agroecology also promotes the biodiversification of those organisms associated with the agroecosystem. Vandermeer and Perfecto (1995) recognise two types of biodiversity within agroecosystems: planned biodiversity, which includes the crop plants and animals purposefully introduced by farmers; and associated biodiversity which includes the soil flora and fauna, herbivores, carnivores, and decomposers who colonise agroecosystems from the surrounding environment. The morphological and life cycle characteristics of the planned biodiversity, and the management systems put in place to manage that biodiversity have a direct impact on the associated organisms. As the associated biodiversity present in agroecosystems provides many vital ecological processes and services for agroecosystems such as: pest control and regulation, nutrient cycling, and the elimination of toxic inputs and residues (Hendrix *at al* 1990), it is vitally important for agroecologists to devise strategies that exploit the synergies that exist between the planned and associated biodiversity present within agroecosystems (Altieri, 1993).

The five principles mentioned above form the ecological basis of the agroecological perspective; these will all be reintroduced in chapter 10 when I analyse the adaptations of Campagao's farmers over time. While these principles have been discussed separately, it is important to consider them as a systemic whole. The interactions between soil, water, air, genetic resources, and associated biodiversity are complex; one of the central contentions of the agroecological approach is that we need to understand these interactions better, i.e. we need to build greater knowledge of how the ecological principles that underpin natural ecosystems also underpin agroecosystems, and we need to exploit those interactions better. However, this exploitation does not take place in a social vacuum -- it is socially mediated. While it may be relatively easy from an ecological perspective to describe what needs to be done to manage agroecosystems in a more sustainable way, this transformation will not occur without accompanying social transformations. It is to these issues that I will now turn.

3.2.3 *Social transformation and agroecology*

The development of more sustainable systems of agricultural production will require profound social changes. It is pointless to attempt to promulgate technical solutions to agricultural problems -- even if they are based on ecological principles -- in the absence of socially, economically and politically enabling conditions. While the agroecosystem perspective and the ecological insights of agroecology are important aspects of the move towards sustainability, these need to be grounded within the social, economic and political reality of rural life – i.e. within the everyday life of farmers. As Gliessman rightly states "[I]t is one thing to gain an understanding of what makes an agroecosystem function, yet it is quite another to apply such knowledge to solving the everyday problems faced by farmers around the world" (Gliessman, 1990: 3). What is required is an interface between our understanding of ecosystems theory as it relates to agriculture, and the much more complex social, economic and political systems through which agricultural production is mediated (Hart, 1986; Pretty, 1995).

However, within the agroecological approach, and indeed within the sustainable agriculture movement in general, direct engagement with these complex social issues has been de-emphasised (Allen, 1993). Issues such as distribution, equity, and poverty are background issues within the sustainable agriculture movement (Buttel, 1993). For example, much agroecological literature (e.g. Lowrance *et al*, 1984; Carroll *et al*, 1990; Gliessman 1990, 1998; Altieri, 1995) tends to focus on the naturalistic aspects of agroecology (i.e. the application of ecological principles to agricultural production) as opposed to the social transformations that would be required to actually operationalise these principles. That is not to say that some of these authors have not made significant contributions to the social transformatory aspects of agroecology – they have (e.g. Altieri, 1988); and indeed some chapters within the aforementioned books contain some very useful insights into some of these very important social issues. But in general the agroecological literature has failed to fully integrate the ecological with the social, and this is something that the authors in question admit is required (e.g. Gliessman, 1990; Altieri, 1995).

Gliessman (1990: 8) suggests that "[T]he challenge for agroecology, then, is, to find a research approach that consciously reflects the nature of agriculture as the co-evolution between culture and environment, both in the past and the present". This is a laudable suggestion, but one that is very difficult to realise. One of the methodological restrictions to the realisation of a research approach that integrates the social with the ecological within a co-evolutionary perspective is the problem of scale. Within agroecology, the agroecosystem is the unit of analysis, and, as we have seen, agroecosystems vary in scale from the crop plant interactions within a field, to household and even international level interactions – however, the vast majority of agroecological research takes place at the lower levels of the agroecosystem hierarchy such as the plant/environment, crop and field levels. These ecological and sometimes very technical analyses often exclude reference to the broader social systems that mediate agricultural production. While this may not always be necessary – and indeed would be pointless if one is looking at very complex ecological issues (e.g. the ecological reasons for higher yields in intercropping systems, or the benefits of natural enemy augmentation) -- a higher level analysis that incorporates political, social and cultural perspectives is particularly important if we are trying to do more than just understand ecological relationships.

Aside from the problems with scale, another problem resides in the tendency towards naturalism and technocracy within the sustainable agriculture literature and movement (Allen and Sachs, 1991; Buttel, 1993; Altieri *et al*, 1997; Goodman, 2000). Much of the debate over agricultural sustainability takes place within a natural science discourse (Allen, 1993). Primacy is placed on developing sustainable technologies that are verified by natural scientific methods, this is a focus of much of the agroecological literature. However, the extent to which science and technology can solve pressing agricultural, and broader food supply issues must be questioned (Allen, 1993).

There has been a perception within the sustainable agriculture movement that sustainable agricultural technologies (SATs) are somehow neutral (Altieri, 1988). This assumption is influenced by a perception that SATs are always environmentally, economically and socially beneficial (Altieri, 1988). However, this is a misguided and dangerous view that is problematic for four reasons (Altieri, 1988). Firstly, if the capital relations of production are ignored, SATs can be preferentially delivered – as happened throughout Asia during the green revolution; secondly, a focus on low input technologies may influence the development of biotechnologies that are clearly not capital or scale neutral, and which will lead to corporate dependence. Thirdly, corporations and others driven by profit may appropriate the 'sustainable' agriculture market in order to make greater profits, thus forcing out smaller producers. Lastly, if a focus on environmental quality becomes a sufficient condition of sustainable agriculture, issues such as poor wages, exclusion of certain classes and races from sustainable agriculture, and poor working conditions may be overlooked (Allen and Sachs, 1991).

A type of technocratic sustainability is now being witnessed, within the sustainable agriculture sector -- most explicitly within the American organic farming movement. Within this movement there is a pre-occupation with technical farm practices on an industrial scale (Goodman, 2000). Following what Goodman *et al* (1987) have called a 'productionist ethos', many organic farmers in the United States, most notably in California, are becoming dependent on external inputs used in large monocultures - thus contradicting the ethics and philosophy of sustainable agriculture and agroecology (Goodman, 2000). The extent of so-called 'shallow' sustainability initiatives (Guthman, 2000) within the organic farming industry makes one sceptical about the extent to which so-called 'managerialist' models of sustainable agriculture (Goodman, 2000) can actually bring about the types of socio-ecological transformations necessary to achieve true sustainability.

Agroecology and the sustainable agriculture movement in general needs to reconnect with its social transformative roots. However there is little guidance as to how a more radical-transformative approach may arise. Systems approaches to agricultural sustainability and sustainable resource management – most notably Pretty (1995), Berkes and Folke (1998) and Roling and Wagemakers (1998) – provide excellent frameworks for understanding the myriad of epistemological, social, and environmental problems with high input conventional agriculture, and they also present excellent conceptual frameworks for thinking about what a sustainable agriculture may be; but as with agroecology, they fail to address the need for wholesale social reform -- these frameworks assume that sustainability can be achieved within the current political-economic system. This thesis will suggest that these weak approaches do not address issues of social and political transformation which are prerequisites for agricultural sustainability.

Alternative agricultural strategies are about regaining economic democracy, i.e. the right to participate in the economic decisions that affect us (Kloppenburg, 1991). As Friedman rightly states, "Food has always been about power and money" (Friedman, 1993: 214), and the commodification and dependency now associated with global food systems will only increase with growing corporate control. By applying ecological principles to agricultural production, a farmer is able to sever the links of dependency that are inherent aspects of high input approaches to agricultural production. Unfortunately there are significant epistemological, economic, social, and political barriers to the adoption of agroecological approaches. Therefore agroecology needs to adopt a more transformative approach, one that directly tackles the barriers to sustainable agriculture. The following chapter will investigate the issue of social transformation towards sustainability more explicitly; particularly, the important role power, knowledge and relationships play within agricultural development.

4. Social transformation towards sustainability – a critical analysis of key concepts

How can the social transformation towards agricultural sustainability be achieved? How can we transcend the epistemological, social, economic and political barriers to the adoption of more sustainable systems of agricultural production? These questions are crucial to this thesis, and have been the subject of much recent debate (see Yapa, 1993; Altieri, 1988; Dove and Kammen, 1997; Pretty, 1995; Röling and Wagemakers, 1998; Uphoff, 2002). There has been a growing realisation that technological solutions to agricultural problems are inadequate, and that more emphasis needs to be placed on the important roles of power, knowledge and relationships (Röling and Wagemakers, 1998; Uphoff, 2002). This is reflected in the large volume of literature devoted to the concepts of participatory development, social capital and local knowledge (which will discussed at length in this chapter); and the realisation of the importance of these issues within mainstream development circles.

This chapter serves a twofold purpose; the first is to critically analyse important theoretical issues within the development, social capital and knowledge literatures – social capital, local knowledge and participatory development are often quoted as being of critical importance for the development of more sustainable systems of agricultural production (see Pretty, 1995; Röling and Wagemakers, 1998; Pretty and Ward, 2001; Uphoff, 2002), however, these three terms are often used in an unreflective and celebratory way; I will suggest that when they are used in this fashion they contribute little to the understanding of how social transformation towards sustainability can be achieved. The second purpose is to introduce my particular theoretical perspective in relation to the important issues of development, social capital and knowledge; I will do this by discussing the concepts of transformative participatory development, context dependent social capital, and subaltern knowledge.

The chapter will begin with a discussion of the powerful and ubiquitous concept of development. I do not intend to outline its extensive history, but instead to reflect on its most recent incarnations, namely the Washington consensus, the post-Washington consensus, and Participatory Development. This discussion will provide the reader with an understanding of the way in which mainstream development has focussed on technocratic solutions to development problems, largely ignoring the more complex social transformative issues. I will then suggest how the transformative power of development can, and should, be recaptured through the repoliticisation of participatory development, and through rights-based citizenship participation. Following on from this, I will discuss a concept that has captivated the development industry in recent years, namely, social capital. I will suggest that the concept of social capital, while widely criticised, is nevertheless still very useful in both an analytical and transformative sense. I will argue that the utility of the concept can be regained through critically analysing the types of social capital that exist, the context of social capital utilization, and the role of agency in realising the potential of social capital. I will argue that the instrumental use of social capital can be an important transformative tool towards sustainability. However, I will shy away from some of the more celebratory usages of the term. To conclude, I will discuss some of the problems with current conceptions of indigenous knowledge, and suggest that more emancipatory concerns that focus on critical reflection will be required if a truly transformative participatory development is to become a reality.

4.1 Development

In a relatively short time (i.e. since 1948) development programs have changed the economic, political and social lives of billions of people, and transformed innumerable cultures. That development is a modern western construct closely tied to the contested notions of progress and modernisation is a fact accepted by development theorists of various persuasions (e.g. Black, 1992; Escobar, 1992; Esteva, 1992; Hettne, 1995; Cowen and Shenton, 1996; Rapley, 1996; Rist, 1997). Development, in its popular uncontested conception, is commonly associated with an improvement in the well being of the 'underdeveloped', i.e. it is generally seen as a positive thing, at least by those who promulgate it (e.g. Nation-States, The World Bank, United Nations, World Trade Organisation). However, for some, particularly those who focus on the consequences of development – in contrast to those who unquestionably believe in its innate goodness – it is destructive of both social relations and the natural environment, and needs to be transgressed (Rist, 1997), or it is a tool of political and economic oppression that requires a radical overhaul (Monbiot, 2003). These criticisms are, however, not the mainstream view.

Since the beginning of the development era -- post World War Two – the term has infiltrated all manner of institutions, and has come to mean many things to many people, as the quote from Black (1992: 15) below testifies:

> Development is a standard borne by those who promote the interests of the affluent and the powerful as well as those who would serve the unaffluent and unpowerful; by those who would expand the reach of the most industrialised states and those who would shield the least modernised from nefarious influences; by those who stress the virtues of entrepreneurship and individualism and those who would nurture community and collective concerns; by those who pursue strategies of top-down initiative and decision making, and those who advocate a bottom up or grass roots approach; and finally, by those who would exploit and maim Mother Nature for the benefit of business or labour in today's world, as well as those who concern themselves with a bountiful and liveable environment for future generations.

The culturally and economically deleterious impacts of contemporary development have been critiqued by many authors (see Esteva, 1992; Escobar, 1992; Rist, 1997; Monbiot, 2003), and as we will see, these critiques -- often from within international development institutions themselves (e.g. Stiglitz, 1998) -- have influenced the trajectory of development within these powerful institutions. The following discussion will focus on these trajectories, analyse their central tenets, and discuss their impact on development policies.

4.1.1 *The Washington Consensus*

The Washington Consensus (WC) refers to the program of development based on neoliberal prescriptions that became popular within international development institutions in the 1980s. With a focus on macroeconomic stabilisation, and encouraging an outward-looking market orientation within developing countries (Williamson, 1993), this consensus superseded the interventionist models of the 1960s and 1970s which were widely criticised as failures – particularly in those countries with weak governments (Bauer, 1972; Lal 1983).

The neoliberal revolution ushered in an era of deregulation and unfettered market freedom (Berthoud, 1992), wherein costs were shifted from the state to the individual, labour markets were loosened up, and restrictions to the free flow of capital were removed (Gamble, 2001). In practice, these neoliberal prescriptions were delivered through Structural Adjustment Packages (SAPs) that were designed to improve macroeconomic stabilisation, and encourage trade liberalisation through decreasing government spending, privatisation, currency devaluation, deregulation of the financial and labour markets, specialisation according to comparative advantage, and the promotion of a minimalist state (Brohman, 1995; Rapley, 1996).

Needless to say these austere measures had significant impacts on the poor within developing countries, as social expenditure and wages were cut (Chossudovsky, 1997). The adverse consequences of SAPs and growth-orientated development strategies on the world's poor have been documented by many scholars of development throughout the world, in the areas of employment, health, food production, education, food security, environmental degradation, environmental policy, manufacturing, income distribution, wages and inflation (see Bernstein, 1990; Munasinghe, 1993; Pastor, 1995; Lall, 1995; Geske-Dijkstra 1996; Haynes, 1996; Rapley, 1996; Boratav *et al*, 1996; Dasgupta, 1998; Stiglitz, 1998[a]; Maxwell, 1999; Kaimowitz, *et al*, 1999; Cerutti, 2000; Cornia, 2001; Handa and King, 2003).

The WC represented a new trajectory for development, in that -- in contradistinction to interventionist models – it focussed on the immanent development of capitalism, as opposed to the intentional development of nation states (Cowen and Shenton, 1996; Thomas, 2000). As Gore (1999) suggests, this marked a move from a historical conception of development-- i.e. tailoring interventions to the needs of a country depending on the economic and institutional maturity of that country – to an ahistorical perspective wherein mature and immature economies are managed in the same way.

4.1.2 *The Post-Washington Consensus*

Widespread disillusionment with the WC, and the negative impacts of SAPs in particular, have forced the world's development institutions to modify the mainstream trajectory of development, and to retreat from the overtly neoliberal prescriptions of the WC (Mosley, 2001). This has extended to limited self-criticism on behalf of the development institutions themselves for their promulgation of neoliberal development policies (Amin, 1997). The new trajectory is often referred to as the Post-Washington Consensus (PWC).

Joseph Stiglitz foreshadowed the move towards this more interventionist approach to mainstream development by the world's international development agencies in his much cited WIDER lecture in 1998 (Stiglitz, 1998). In this lecture, the then Chief Economist of the World Bank criticized the narrowness of the neoliberal prescriptions underlying the WC, and suggested that states could play an activist role, complementary to markets. Stiglitz argued that governments have "an important role to play in responding to market failures, which are a general feature of any economy with imperfect information and imperfect markets" (Stiglitz, 1998: 15). In contrast to the WC, Stiglitz suggested that the "choice should not be whether the state should or should not be involved. Instead, it is often the matter of how it gets involved" (Stiglitz, 1998:15). Within this conception, states have an important role to play as providers of education, and in facilitating the transfer of technology (Stiglitz, 1998).

However, the development goals of the PWC, relate to more than just the use of an extended set of instruments. According to Stiglitz (1998), the PWC seeks more than just increases in GDP; it seeks increases in living standards – including health and education, 'sustainable development', 'equitable development', and 'democratic development'. The principles upon which the PWC rests include in Stiglitz's terms, 'ownership by developing countries' of the policies used for their own development, and 'a greater degree of humility, the frank acknowledgement that we do not have all the answers' (Stiglitz, 1998). Since the codification of the PWC, terms such as 'participation', 'empowerment', and 'social capital' have become common parlance within the World Bank.

Since Stiglitz's exposition of the PWC much debate has ensued as to its influence on development policy, its status as a new paradigm, and the extent to which it is just a more humanised version of the WC. For example, Mosley (2001), commenting on the similarities and differences between the WC and PWC, suggests that while some of the PWC prescriptions are inconsistent with the WC, many others are not, and the "old agenda of rolling back the frontiers of the state remains" (Mosley, 2001: 307). And Gore suggests that while the PWC does adopt a broader, long-term and historical perspective compared with the WC, it could however be interpreted as "a change to preserve the old order by making it more humane" (Gore, 1999:801).

The PWC has also been criticised by more radical commentators for its modernist perspective, and its colonisation of the non-economic. For example, Parkins (2000) argues that the transformative strategy of the PWC -- as expounded by Stiglitz -- has the now discredited ideas of modernisation theory as its intellectual foundation. Parkins concludes that the PWC is a "third-way type challenge to neoliberalism on the basis of innovative economic analysis, combined with an attempt to incorporate the fundamental ideas of modernisation theory into the heart of development policy on the basis of 1990s participatory rhetoric" (Parkins, 2000: 4).

The PWC has also been criticised for being a tool of economics imperialism, i.e. a strategy through which the narrow prescriptions of reductionist economics can colonise the social sciences of development at the expense of a radical political economy approach that focuses on issues of 'class', 'power', 'conflict', and contested notions of development (Fine, 2002[a]; 2002[b]). Fine (2002[b]) argues that the broader social and economic transformations required to achieve development will not be addressed by the PWC.

Despite these criticisms, the PWC is different to the WC in many aspects: for example, it explicitly recognises that market imperfections exist; it recognises the need for state intervention to achieve developmental goals; and it has a historical, as opposed to an ahistorical, perspective. In contrast to the WC, which negated the role of development theory and intentional development, the PWC has reopened debates on the typologies of development and the transformation of societies. Having said that, I agree with Parkins' (2000) view that much of the intellectual foundation of the PWC is based on rhetoric, as the following discussion of participatory development will suggest.

4.1.3 *Participatory development: rhetoric or alternative?*

Participatory development (PD) is considered a vitally important element in the move towards more sustainable modes of agricultural production. Scholars of agricultural sustainability suggest that PD is important for a number of reasons: it can maximise human resources; it can build vital farming skills; it aids in the communication between farmers, extensionists and researchers; it can ensure that more appropriate technologies are developed; it can help improve group solidarity; and it can also build the dignity of those who are the targets of agricultural development initiatives (see Pretty, 1995; Röling and Wagemakers, 1998; Uphoff, 2002).

Since its emergence in the 1990s, PD has received widespread support from the world's international development institutions. And many agricultural development initiatives undertaken by these institutions aim to achieve outcomes similar to those mentioned in the preceding paragraph, with the help of participatory development strategies. The World Bank, the UNDP, and the FAO all insist that PD and other concepts such as *social capital* and *governance* are crucial to the success of their agricultural development projects. This emphasis on the social elements of development is indeed a turnaround from the 1980s, when neoliberal development prescriptions focussed on market liberalism and little else.

The mainstreaming of PD within these institutions raises questions about the extent to which PD can now be considered an alternative development trajectory in its own right, which in turn raises questions about the practice of PD, and the extent to which it can be considered a truly transformative development trajectory. In this section, I do not intend to recount the history of PD or participation at length; I do intend however to critically assess the contemporary apolitical practice of PD, and to suggest that PD needs to revisit its radical- transformative roots if it is to recapture its role as an alternative to mainstream development. In doing this, I am not suggesting that the contributions of PD to sustainable agriculture are not important -- they are; what I am suggesting is that the instrumental aspects of PD need to be augmented with a more transformative approach. Within this context 'transformative' refers to an approach to development that enables participants to change the oppressive conditions which affect them. It implies the transference of real power, and an increase in capacity to effect change in local social and political realms. It means building political capability and critical consciousness, demanding rights, and forcing powerful actors to be accountable for their actions (Cornwall, 2003). It is not rhetoric but a genuine realisation of rights.

Participation in development theory has a long and varied history, from the radical-emancipatory ideas espoused by Freire (1970); to the work of Chambers (e.g. 1983; 1994; 1997), with his focus on the empowerment of rural people, indigenous knowledge and farmer innovation; through to the adoption of populist participatory approaches by northern development professionals during the 1990s; to the focus on social capital and building local institutions (e.g. World Bank Social Capital and Civil Society Working Group; Woolcock, 1998; Narayan, 1999); and most recently the work on participatory citizenship and participatory governance (Gaventa and Valderamma, 1999; Gaventa, 2003). While the various participatory approaches to development share an interest in the social elements of development, the motivations and scope of the various modes of participation vary extensively, as Cornwall (2003) has demonstrated – see Table 4.1.

Table 4.1: Modes of Participation (Cornwall, 2003)

Mode of participation	**Associated with…**	**Why invite/involve?**	**Participants viewed as….**
Functional	Beneficiary participation	To enlist people in projects or processes, so as to secure compliance, minimise dissent, lend legitimacy	Objects
Instrumental	Community participation	To make projects or interventions run more efficiently, by enlisting contributions, delegating responsibilities	Instruments
Consultative	Stakeholder participation	To get in tune with public views and values, to garner good ideas, to defuse opposition, to enhance responsiveness	Actors
Transformative	Citizen participation	To build political capabilities, critical consciousnesses and confidence; to demand rights; to enhance accountability	Agents

As the following discussion will indicate, the functional, instrumental and consultative modes of participation have now been incorporated into the mainstream development practice of the world's international development agencies, and the transformative potential of participatory development has been largely lost through the process of depoliticisation. The following critique will focus on the non-transformative modes of participation, and discuss the ramifications of their mainstreaming into development policy.

4.1.3.1 Community Empowerment

In international development parlance, the notion of empowerment has achieved ubiquitous popularity, particularly when it comes to characterising the political dimensions of poverty. However, as the following review will demonstrate, the ubiquitous use of the term has done little to redress the asymmetries of power that continue to adversely affect the lives of poor people in the developing world, and with an increase in the scope and control of global corporations and decreasing participation in, and representation through, the democratic process, one could argue that these power asymmetries are also salient issues in the so-called developed world as well (see Monbiot, 2003).

Part of the problem relates to the various definitions of empowerment. Definitions of empowerment vary from the politically radical, such as Bookman and Morgen (1988:4): "We use the term empowerment to connote a spectrum of political activity ranging from acts of individual resistance to mass political mobilisations that challenge the basic power relations in our society…", to the cynical "…empowerment [as] part of a neo-populist strategy supporting 'participatory' approaches that emphasise 'listening to people', understanding the 'reasoning behind local knowledge', 'strengthening local organizational capacity', and 'developing alternative development strategies from below' (Long and Villarreal 1994:50), to a focus on the "expansion of [the] capabilities and assets of poor people….(Narayan *et al*, 2002: 5). From the radical, to the populist, to the economic, empowerment not unlike development is in danger of becoming all things to all people.

The perspective that does matter, however, is the perspective of the powerful. As Moore (2001) has suggested, the definition implicitly used by the world's international development institutions is a materialist one, one that assumes that improving the material wellbeing of the poor will in turn 'weaken interlocking constraints of social, economic and political dependence, and provide poor people with greater freedom and autonomy, personal and political' (Moore, 2001:324). The problem with this definition is that the coupling of material progress, to political and social empowerment (whatever that might mean) allows development agencies and governments to argue that they are achieving empowerment by simply carrying out their development projects, they need do nothing else to demonstrate their commitment to empowerment (Moore, 2001).

The focus of these materialist empowerment initiatives is commonly the 'community'; an often ill defined, or indeed, undefined entity in itself, but one that is understood to have -- from the perspective of the three modes of PD outlined in table 4.1 -- some kind of innate developmental potential that just has to be unleashed. The uncritical acceptance that communities are appropriate targets for development is not satisfactory for a number of reasons. For example, Cleaver (1999) suggests that there is an assumption within PD that communities are unitary, and that they have identifiable natural, social and administrative boundaries; she argues that this is not the case, and that boundaries shift, overlap, and are subjective. She suggests that the delineation of community boundaries arises more from an administrative need than from a concrete reality.

There is also the problem of coming to grips with the social stratification and conflict that exists at the community level. As many studies from the PD literature have demonstrated, it is within the village community context that much exclusion and suffering occurs, whether it be from gender bias, age discrimination or social status discrimination (e.g. Mayoux, 1995; Cornwall, 1998; Guijt *et al*, 1998; Williams *et al* 2003). This can produce, within some PD perspectives (most specifically that of Gender and Development (GAD)) – a predilection towards imposing culturally specific frames of reference based on, for example, "essentialised images of 'woman-as-victim', or 'man-as-problem'" (Cornwall, 2003: 1326) which may undermine the supposed participatory agenda by ignoring, for instance, the lot of marginal men (Cornwall and White, 2000).

Another problem relates to bestowing onto communities potentialities they simply don't have: this is one of Cleaver's (1999) 'myths of community'. The suggestion that "all that is required is sufficient mobilisation, and the latent and unlimited capacities of the community will be unleashed in the interest of development" (Cleaver, 1999: 604) is a position based on an ignorance of the very real structural and resource constraints that affect communities (Cleaver, 1999). These constraints may be environmental, educational, political, social or economic. Within PD, particularly in the writings of Chambers (see 1997), this celebratory view of community is accompanied by a cultural foundationalism that focuses exclusively on the positive aspects of the culture in question; the task of development is one of realising the potential of that culture. This view makes it impossible to critique the negative aspects of local cultures (e.g. oppression of minority groups), and creates contradictions when the goals of the development project clash with the values of the local community. As Cleaver posits "Is there not a danger of swinging from one untenable position ('we know best') to an equally untenable position ('they know best')?" (1999: 605).

More cynical critiques of the current community empowerment fashion suggest that it is nothing other than cheap talk. For example, Moore (2001) criticises the coupling of community with empowerment, and suggests that there is no basis for assuming that the micro community level is the best level at which to organise the poor. He contends that effective political action by the poor usually revolves around them coalescing in large-scale organisations that represent them in terms of their socio-economic status (e.g. small farmer, tenant), or socio-cultural identity (e.g. ethnic grouping). The term is cheap talk because "governments and politicians in developing countries understand full well that mobilization of the poor at the community level poses no serious threat" (Moore, 2001: 323). Moore (2001) suggests that the development industries' notion of community empowerment is a way of placating more radical constituents (e.g. NGOs), at the same time as reassuring another -- nervous governments perhaps-- that their community empowerment projects will have no political ramifications.

4.1.3.2 The repoliticisation of participatory development

As the foregoing discussion indicated, PD has been appropriated by mainstream development agencies, and is now seen more as a technical tool as opposed to a transformative process. What was once an overtly political concept has become neutralized (White, 1996; Leal, 1999; Hickey and Mohan, 2003); this neutralization has been facilitated by the ambiguity of participation both as a concept and a practice (White, 1996). Participation has now become development orthodoxy, and the terminology has been used to legitimise a revised form of neoliberalism (Hickey and Mohan, 2003). As we have seen, the PWC is the most recent incarnation of this revised neoliberal development trajectory. The politically agnostic nature of contemporary PD has also been influenced by its internal focus on techniques and its technocratic focus on project management (Mosse, 1995); the translation of the political into the technical is one of the hallmarks of mainstream participatory development's technocratic stance (Leal, 1999).

What is the way forward? While I agree with many of the critiques of development theory made by post-development theorists such as Escobar (1992), Esteva (1992), and

Rist (1997), and while I share with them disillusionment with the contemporary practice of development, and agree that its focus on the market, progress, and economic conceptions of exchange are flawed, I agree with Pieterse (1998) that aside from critique, post-development positions offer very little that is constructive, and their blanket criticism of modernism, in its varied forms, offers little room for reworking modernity in a more critical, reflexive way.

It is clear that huge disparities in power, wealth and human rights exist across the world; however, I do not see how these disparities can be addressed with criticism but without action. These disparities exist in all cultures, western or otherwise. We need to consciously and proactively transform the power relations that cause the disparities mentioned above; harking back to some golden age when life was supposedly better, or unleashing the power of local knowledge and local communities, while important, will not be enough to address the dire human need that the poor of this world face; there are powerful political barriers that prevent the more equitable distribution of resources, and without a transformative, critical development agenda, the poor of this world will not share equally in these resources.

Participation (in its populist conception) does not mean sharing in power (White, 1996); if social transformation that will benefit the world's poor is to occur, then the transformative capacity of the people needs to be enhanced through the facilitation of "collective analysis on the causes of marginalization and powerlessness and what actions can be taken to counteract them" (Leal, 1999: 5). Development should be about the equalization of power, and the transformation of those power relations that provide the context within which oppressive political and economic conditions can flourish. Therefore, participatory development needs to be repositioned within a radical politics of development that facilitates social transformation (Hickey and Mohan, 2003).

Hickey and Mohan (2003) -- upon reviewing numerous case studies from throughout the developing world – identify four crucial components of successful radical-transformative approaches to participatory development. First, they suggest that development projects must be explicitly focussed on transforming power relations, as opposed to simply focusing on technical service delivery. For example, successful cases of democratic decentralization in the Indian states of Kerala and West Bengal have been influenced by broader political transformations that focussed on the political as opposed to the technical benefits of decentralisation; these projects facilitated the political mobilisation of groups often marginalised in Indian politics (Harriss, 2000) and enabled the state to reinvent its leftist politics within a broader scheme of redistributive politics and social justice.

Second, the authors suggest that successful transformative development projects have focussed explicitly on the concept of citizenship participation. This notion links the political, community and social spheres of participation (Gaventa, 2003), and as opposed to the liberal notion of citizenship, which focuses on individual legal equality, and a set of rights and responsibilities bestowed by the state, citizenship within the participatory literature focuses on citizenship as practice (Gaventa, 2003). In this conception, citizens play an important role in shaping and determining their communities through direct political involvement and decision-making (Lister, 1997). Citizenship is conceived of as a right; as Lister (1998: 228) testifies, "the right of participation in decision-making in social, economic, cultural and political life should be included in the nexus of basic human rights.... Citizenship as participation can be seen as representing an expression of human agency in the political arena, broadly defined, citizenship as rights enables people to act as agents".

Within this participatory notion of citizenship, one's agency as a citizen is not limited to national or state-based citizenship; an individual can be a member of parallel political communities that exist at a multitude of levels, from the national to the community, including the ethnic – as such the notion encompasses multiple standpoints (Hickey and Mohan, 2003). Hickey and Mohan (2003) suggest that the desires of these disparate groups can be met through a new form of critical modernism, which, while retaining modernist notions such as emancipation and democracy, also recognise that "modernity is not a singular entity which unfolds in a linear fashion such that you have more or less modernity ranging along some teleological timeline" (Hickey and Mohan, 2003: 37); within this conception, modernity is fragmented and situated in local practices – the notion of an ideal European modernity is surpassed.

Development then becomes a much more political and dialectical process that has to address the concerns of the multitude of political communities, and their multiple modernities.

The critical modernism proffered by Hickey and Mohan (2003), while recognising the importance of difference, does not go to the relativist extremes of the postmodern position. While the importance of alternative spiritual and cultural values is acknowledged, the central concern of the critical modernists is with addressing the material disparities that exist within and between countries. As Hickey and Mohan (2003: 38) state "[F]or critical modernists the bottom line is material well-being". The critical modernist position recognises the right of political communities to demand alternative ideas of development, and recognises that, as citizens, these communities have the right to control the resources and institutions that provide their material well being.

The third condition of successful radical-transformative approaches to PD rests in the disarticulation between political and economic power, and the means to attain them. Hickey and Mohan (2003), with reference to the Indian examples of West Bengal and Kerala, maintain that the political elite were able to gain power without being captured by the economic elite. Such a lack of patrimony would clearly have important repercussions for the types of redistributive reforms that could be undertaken by a government. As chapter 5 will demonstrate, the case of the Philippines is entirely different; patrimony is ubiquitous, and as such the redistributive reforms undertaken there have lacked substance, and are more of a political tool designed to placate the peasantry, as opposed to being genuine social reforms.

Fourthly, Hickey and Mohan (2003) stress the importance of attaining a degree of institutionalisation to better realise the political goals of disparate political communities. This includes the institutionalisation of social movements (the formation of groups, and the recognition of their status), and the institutionalisation of participatory processes through regulations. However, while participatory political processes need to be institutionalised, the focus must not be on 'getting the institutions right', rather focus should be directed towards ensuring that participatory political movements "secure their autonomy and transformative potential through developing a radical political project that articulates a notion of participation as citizenship" (Hickey and Mohan, 2003: 27). This is important because the institutionalisation of participatory processes may not, in certain circumstances, facilitate real citizenship participation.

The foregoing discussion highlights ways in which the transformative potential of participatory development can be recaptured. The transformative approach, which emphasises rights-based citizenship, the delinking of economic and political power, and the importance of situating PD within a broader radical-political project, is clearly distinct from the functional, instrumental and consultative modes of participation outlined in Table 4.1. These less transformative modes of participation are, however, still important development tools: they allow development projects to run more efficiently, and they can better address the desires of local peoples; however they cannot contribute to the sustained transformation of the immanent processes that create inequality. In the following section I will discuss how the concept of social capital can augment the transformative participatory development (TPD) approach to contribute to the social transformation that will be required for the development of more sustainable systems of agricultural production.

4.2 Social Capital

Alongside PD, the building and maintenance of social capital is considered an important contributor to the development of more sustainable systems of agricultural production. According to Pretty (2002: 48), social capital "captures the idea that social bonds and social norms are important for attaining sustainable livelihoods". Within the agriculture and natural resource management sectors, social capital is seen as vitally important because it facilitates the collective management of resources. From catchment management, to irrigation users groups, to crop protection and integrated pest management, more productive and sustainable solutions to agricultural management issues are believed to derive from participation in a group (Pretty and Ward, 2001; Pretty, 2002). Suggested further benefits include enhancing social learning, facilitating innovation and the cross fertilization of ideas, and promoting better partnerships between all actors within the agricultural sector (Pretty, 2002).

The concept of social capital has gained widespread legitimacy within the world's international development institutions over the last decade or so. Clearly, this is closely linked to the rise of the PWC, and a concern to "challenge the ideological hegemony of the strict neoclassical economists" (Fox, 1997:964). Social capital is indeed so widespread in development parlance that it has achieved even greater ubiquity than its cousin participation (Francis, 2001); this popularity is due to its attractiveness to both the neoliberal right, and those who would promote participation and empowerment (Harriss and De Renzio, 1997). And not unlike participation and empowerment, the celebratory and unreflective use of the term has affected both its heuristic usefulness and its political legitimacy. If social capital is to retain its usefulness as a concept we need to be sure of what it is and exactly how it should be used both as an analytical tool and within the development process.

The following discussion will introduce a context-dependent and instrumental approach to social capital which attempts to maximise both the heuristic usefulness of the notion and its political-transformative capacity. I will not revisit the vast literature that pertains to social capital in its various forms, except to introduce what I feel is the most theoretically influential conceptions of the term, namely (Bourdieu, 1986; Foley and Edwards, 1999; Rydin and Holman, 2004), before commenting on some of the problems with the concept, the different forms social capital can take, and how the transformative power of social capital can be enhanced through the instrumental use of 'bracing' social capital.

4.2.1 Bourdieu and Social Capital

For the French Sociologist Pierre Bourdieu (Bourdieu, 1986), capital can take economic, social and cultural forms; and people are positioned in social space or topography according to their possession of these three forms of capital. Bourdieu defines social capital as "the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalised relationships of mutual acquaintance and recognition -- or in other words, to membership in a group" (Bourdieu, 1986:248). Within Bourdieu's conception, social capital is constructed through the exchanges -- both material and symbolic – which occur between people within geographical, economic and social space. From these exchanges, networks are formed via an "endless effort at institution"; this effort can be conceived of as an investment strategy that leads to the establishment of durable relationships between people.

For Bourdieu "the volume of the social capital possessed by a given agent…depends on the size of the network of connections he can effectively mobilise and on the volume of the capital (economic, cultural and symbolic) possessed in his own right by each of those to whom he is connected" (1986:249). Therefore social capital is both the access to networks and the resources that inhere in these networks. According to Bourdieu, social capital is reproduced through ongoing sociability, which requires the investment of time and energy, and therefore either directly or indirectly, economic capital. Put succinctly, social capital is created through forming durable relationships, the volume of social capital is measured by the extent of these relationships and the resources that inhere therein, and continuing access to social capital requires the investment of time, energy and prudence.

4.2.2 Problems with social capital

Bourdieu's conception of social capital is only one of the many conceptions of the term; the works of both Coleman (1988) and Putnam (1993) have also been influential in this area. Taken together, the many conceptions of social capital have given the term an aura of vagueness, which has contributed to its unreflective and indiscriminate usage (Foley and Edwards 1999; Greeley 1997; Portes 1998; Woolcock, 1998). According to Woolcock (1998), several empirical and theoretical weaknesses have emerged as a result of the use of the term, and from its grounding in different sociological traditions. For example it may be considered as rational, and viewed from a utilitarian perspective (e.g. Coleman); it may be seen as a pre-rational, normative facet of social life (after Durkheim), or it may be seen as ones non-rational social ties (e.g. network theorists) (Woolcock 1998).

This confusion produces a plethora of definitions. Some definitions of social capital focus on its sources, others its benefits, and others its function – and many conceptions of social capital lend themselves to criticism. For instance, if social capital is classified as a public good such as trust (e.g. Putnam, 1993) then it is seen to be a by-product of participation in a collective (e.g. civic associations), but civic associations are themselves public goods and are also identified as social capital, therefore it becomes difficult to distinguish between the sources of social capital and the benefits. As Portes points out, by considering social capital as a property of communities and nations, rather than individuals, "social capital is simultaneously a cause and an effect, it leads to positive outcomes such as economic development and less crime, and its existence is inferred from the same outcomes" (1998:20).

Logical circularity is not just a problem with those definitions that confuse source and benefit. For example, Coleman (1988) defines social capital by its function; he discusses the things that generate social capital (e.g. obligations and expectations etc), the results of its generation (e.g. access to information), and the context of sources and benefits. According to Portes (1998), the resources obtained via social capital are, in nature, like gifts, and as such it is important to make a distinction between the ability to obtain the 'gift' through some type of association, and the resource itself. The inability to access some resource may not be due to one's poor membership of groups or lack of relationships, for example it may simply be due to a lack of means within the group.

While there is no doubt that the concept of social capital contains within it some fundamental insights from the field of sociology, the real question that must be asked is why it is so popular – what is its novelty? According to Portes (1998), the novelty and heuristic power of the term comes from two sources, namely its focus on the benefits of sociability (putting aside concerns with its negative attributes which is a problem we will discuss later on), and because it is a heuristic tool capable of bridging the divide between sociology and economics. It is this interdisciplinary relevance that makes the term attractive to academics from various disciplines. Woolcock (2001) believes this is one of the benefits of the term, and one of the reasons it has become so widely used in academic circles.

A further problem with the term is the fact that it is often perceived as solely beneficial. In many circles, social capital is used in a celebratory way and is considered a panacea for a variety of social problems. While there is no doubt that social capital can improve the welfare of individuals and groups, it must also be realised that it has downsides (Portes and Landholt, 1996; Putzel 1997; Portes 1998). Again, one's conception of social capital informs whether it has positive or negative connotations. For instance, in Coleman's perception social capital is an ethically and morally neutral resource that facilitates individual and collective action (Edwards and Foley, 1998); it can just as easily enhance the operations of a church organisation as it can a drug gang. It was through Putnam's conception that social capital became inculcated with moral and ethical overtones (Edwards and Foley, 1998).

Portes and Landholt (1996) and Portes (1998) have reviewed a number of empirical studies into the downside of social capital. According to those authors there are at least four negative consequences of social capital, including the exclusion of outsiders, excess claims on group members, restrictions on individual freedoms and downward levelling norms. While the social capital literature has largely focussed on the positive aspects of sociability, Portes (1998) suggests that we must realise that sociability cuts both ways; just as trust and bounded solidarity can produce public goods, they can also produce public 'bads' e.g. the Mafia, prostitution, drug gangs or terrorists.

This blindness to the negative aspects of social capital leads to another aspect of social capital that is often neglected, i.e. analyses of power. This neglect is most prevalent within context-independent conceptions of social capital (e.g. Putnam, 1993). Within these conceptions, individual traits such as tolerance, trust and membership in associations are indicators of social capital regardless of context (Edwards and Foley, 1998). However, not all social capital is alike, and some social capital is more productive and beneficial than others. If the context of social capital production and the type of social capital produced are ignored, then so are issues of power.

Viewing social capital as context dependent gives rise to two consequences that, Edwards and Foley (1997) suggest, are not adequately dealt with within the social capital literature, i.e. access to social capital, and the social location of social capital.

Geographical and social isolation and a lack of financial resources can influence access to social capital. For example one's physical location (e.g. living in a remote place) will limit one's access to groups, as groups are few and far between, and a lack of financial resources may mean one cannot physically get to meetings or spend time 'endlessly institutionalising', as Bourdieu would put it.

Furthermore, the social location of social capital influences its use value. For instance, strong social capital may exist between individuals who are economically or politically marginalized (e.g. resource poor rice farmers), and while this may be an important aspect of their day-to-day life, it may do little to address their fundamentally oppressive conditions. In contrast to the context-independent position described above, by focussing on access and significance, the context-dependent position explicitly countenances the wider socio-economic and political context within which social capital is set, as well as countenancing the negative aspects of social capital.

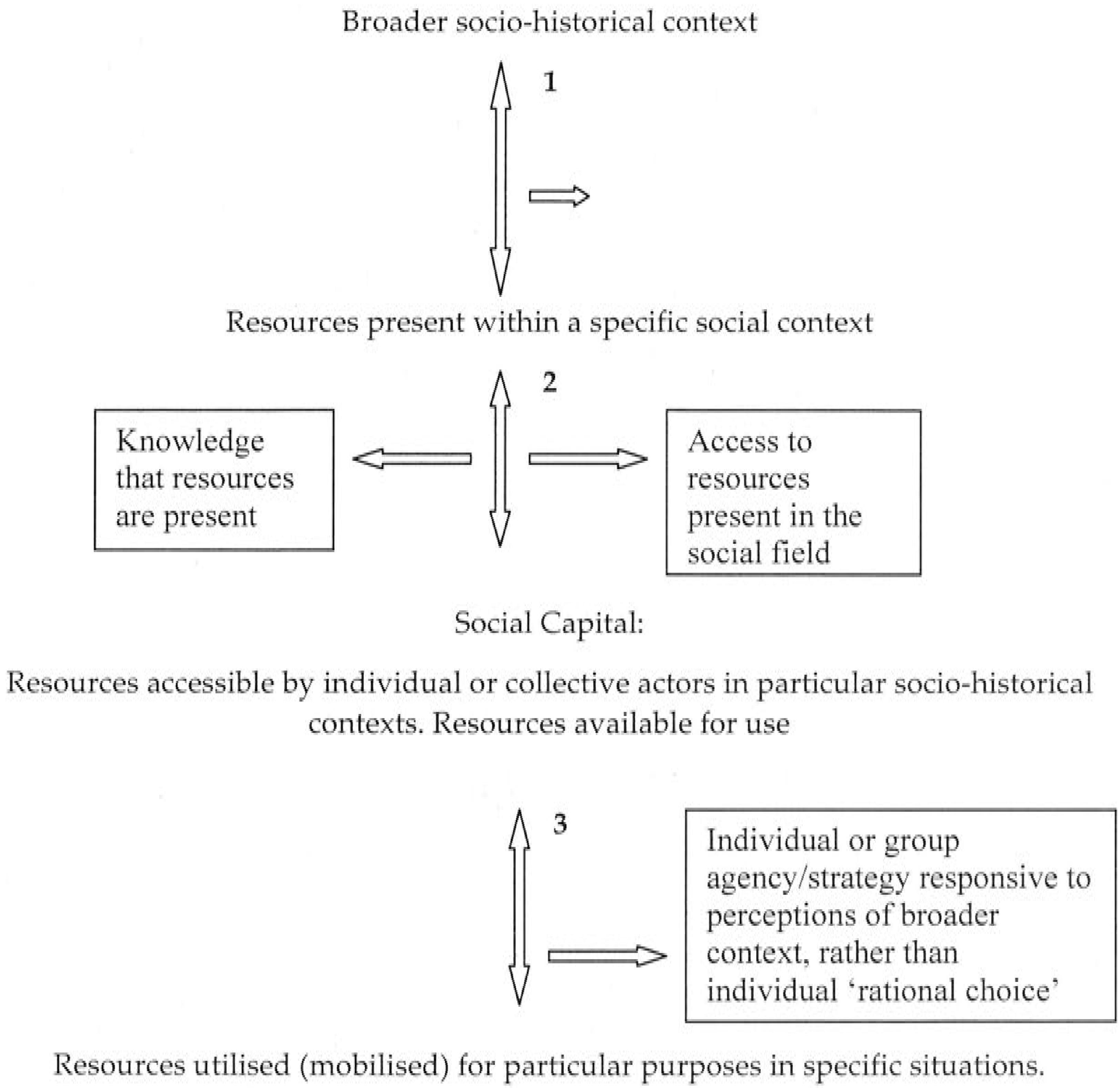
4.2.3 A Context-Dependent Model of Social Capital

Foley and Edwards' (1999) conception of social capital is akin to Bourdieu's (1986) in that they view social capital as the resources that inhere in social networks, and the access to those networks. Within this conception the use-value of social capital is dependent upon the specific social context within which it is found, and an uneven distribution of social capital is countenanced. Foley and Edwards' (1999) model of social capital (Figure 4.1) works at three levels; in that figure, the top arrow represents the uneven distribution of social resources across specific social contexts in a given society. The resources available to an actor are shaped by the socio-economic location of the network, organisation or group to which they belong. To determine the social location of a network, organisation or group, one must examine its embeddedness in broader patterns of inequality and its own attributes (e.g. whether it is characterised by vertical or horizontal linkages).

Access to resources is not only relevant at the level discussed above, as arrow two in Figure 4.1 represents, it is also important at the level of the actor's social field. For instance, in order to appropriate a benefit from a specific social context, individual or collective actors must first recognise that specific resources exist, and they must have some form of social relationship that gives them access to those resources. This is where the information that inheres in social relations becomes important. As the model indicates, individuals or collective actors can be said to have social capital when resources are both present and accessible. As such, measuring the extent of one's networks (access) is only an indirect measure of social capital, because it is only measuring the likelihood of having greater social capital available for use.

The third arrow refers to the role of individual or collective agency. As Foley and Edwards point out "[S]imply because an individual or collective actor has social capital available for use does not mean that they use it immediately until it is exhausted"(1999:168), nor does it dictate how the resource will be used – as we have seen it could be put to good or bad purposes. Individuals and collective actors make strategic decisions on how to use their stock of social capital, and just like economic capital it may be wasted, or used with prudence. The importance of agency in a collective sense has been discussed by Krishna (2001), whose analysis of social capital and agency found that social capital might be high at a community level but low at a supra-community level. Krishna found that villages in India with small amounts of social capital and high levels of agency (i.e. articulate representatives at higher levels) fared better than villages with strong local social capital but inadequate agency. For Krishna (2001), social capital represents a potential that needs to be activated by agency in order to improve development performance.

Figure 4.1 Social capital framework (After Foley and Edwards, 1999)



The strengths of the Foley and Edwards model are threefold. Firstly, the model explicitly accounts for the context dependency of social capital, it recognises that access to social capital is differential, i.e. resources and access are not distributed evenly. Secondly, the model differentiates between the resources available and the access thereto, and thus facilitates the theoretical and empirical investigation of both aspects of social capital. Both of these aspects of the model address the problem of power raised in the previous section. Thirdly, the model does not assume that every individual or collective actor uses their entire social capital all of the time. Thus there is a clear distinction between possession of social capital and its usage. There is also a clear role for agency in activating the benefits of social capital.

4.2.4 Forms of social capital

In order to understand the various ways in which social capital facilitates individual and collective action, it is useful to conceive of it as having three connecting strands: bonding, bridging and bracing. Bonding social capital refers to the strong ties that exist between 'those like us' (Woolcock, 2001), for instance family members, neighbours, close friends and business associates. Bonding social capital connects people who share similar demographic and ethnic characteristics – it can be conceived of as the glue that binds a group together. These bonds are held together by the norms of trust and reciprocity and are characterised by horizontal association, i.e. they are non-hierarchical.

Bonding social capital is particularly important to those who have limited access to resources and minimal extra group linkages. But as we have seen, problems can arise when too much emphasis is placed on bonding social capital (e.g. downward levelling norms, anti social behaviour). While primary groups and networks are important for well-being, they also "reinforce pre-existing social stratification, prevent mobility of excluded groups, minorities of poor people, and become the bases of corruption and co-option of power by the dominant social groups" (Narayan, 1999:13).
According to Narayan (1999), societal well being and collective good is facilitated by the development of cross cutting ties or bridging social capital and a move away from exclusive loyalty to primary social groups. Bridging social capital is characterised by weak ties that connect people from different ethnic, geographical and occupational backgrounds The importance of cross cutting ties has been emphasised by Granovetter (1973) whose famous phrase 'the strength of weak ties' draws attention to the importance of expanding ties beyond the primary network in order to access richer resources and achieve social and economic mobility.

Another type of social capital that has recently entered the literature is that of bracing social capital (Rydin and Holman, 2004). The concept of bracing social capital relates to the instrumental and targeted use of social capital resources to achieve a particular development end. The engineering metaphor has been adopted to emphasise the strengthening of connections between groups. These groups may be of any scale, the connections may be vertical or horizontal, and they may be from any sector of society. As opposed to bridging social capital, which also links groups through networks, bracing social capital emphasises the development and sharing of common norms to solve problems. The goal of bracing social capital is to build the capacity to act. Clearly this type of social capital can play a particularly important role in the furtherance of the participatory citizenship approach, and in coalescing political communities with similar norms and values around a particular issue, thereby strengthening their political capital, and their ability to transform oppressive political and economic structures.

It is important to remember, however, that strong levels of social capital are not a prerequisite for the promotion of democratic ideals (Berman, 1997); social capital can arise through political disaffectation, it can lead to social cleavages and, as we have seen, it can be exploited negatively; as such social capital is not necessarily an indicator of a healthy democracy (Berman, 1997). Social capital development therefore needs to be accompanied by a strengthening of political and public institutions and by an increase in the responsiveness of those institutions to citizen concerns (Berman, 1997).

The foregoing discussion has highlighted how the usefulness of social capital both as a heuristic tool and as a development initiative can be recaptured by emphasising a context dependent model of social capital that expressly countenances the uneven distribution of social capital, the negative aspects of social capital, the important role of agency in activating social capital, and the targeted and instrumental use of social capital to achieve political ends.

4.3 Knowledge

In recent years, the development industry has devoted much time and energy to investigating the role various knowledge systems can play in alleviating poverty and contributing towards a more sustainable future. These investigations have been influenced by critiques of technology transfer models, and by the rise of participatory and sustainable development. In the field of agricultural development, in particular, this has led to a virtual explosion of concern with the role of knowledge and knowledge systems. This has extended to investigations into the role of Indigenous Knowledge (IK) in development (e.g. the Indigenous Knowledge and Development Monitor); systems perspectives on research, extension, and education (e.g. the Agricultural Knowledge and Information Systems thematic group in the World Bank); and systems perspectives that seek to promote more ecologically sound agricultural practices through understanding the linkages between learning, facilitation, institutions and policies (e.g. Ecological Knowledge Systems – Röling and Jiggins, 1998).

In contrast to the era of modernization, when traditional forms of knowledge were considered backward and inferior, the knowledge of traditional or indigenous peoples is now recognised as an important contributor in the search for more sustainable systems of agricultural production and natural resource management (Berkes and Folke 1998; Pretty, 1995; Uphoff 2002). The popularity of IK is not just restricted to those who promote alternative systems of agricultural production; much work has been carried out in the world's international development agencies and agricultural research institutions in this regard. Originally arising from dissatisfaction with the process of westernisation that accompanied development interventions, and the role of scientific knowledge in development (Purcell, 1998), the popularity of IK is now closely tied to concepts of participation, and to the rise of more local and contextual models of development practice.

However, alongside participation and sustainable development, the concept of IK is contestable and problematic for several reasons. For example, IK is often referred to in the literature as an 'Indigenous Knowledge System' (IKS) (e.g. Brokensha *et al*, 1980; Warren *et al* 1991), and this in itself has become a convention within the work of the aforementioned authors, and many others in this field (Kothari, 2002). However, viewing IK as a system is problematic for several reasons. For example, the systems perspective assumes that IK is "coherent, cohesive, consistent, unitary, systematically classified bodies of shared knowledge" (Kothari 2002: 231); assuming that IK has boundaries and is unique to a given culture ignores the problem of the hybridisation of IK, which has undoubtedly occurred over time as western and indigenous cultures have mixed and shared knowledge (Agarwal, 1995). It also assumes that there is such a thing as a unitary indigenous culture in itself. As Bebbington (1991) has pointed out, the term indigenous is often used as a convention, and often includes the knowledge of the rural poor, and people from diverse cultural backgrounds, who may not necessarily be autochthonous to the locality within which they reside, and whose knowledge may be vastly different from the indigenous population. The view that IK is shared equally within communities, or consistently applied, ignores the variability in knowledge that exists within communities, the variety of ways in which knowledge is utilized, and the way in which knowledge processes are embedded in power relations – a Foucaldian insight that surely holds just as much in villages in the developing world villages, as it does for the west.

Viewing IK as a system also facilitates the contrasting of that system to others, for example the scientific knowledge system. This leads to the binary classification of the two systems, which results in either the valorisation of IK, and the accompanying demonisation of scientific knowledge, or the glorification of scientific knowledge at the expense of an irrational IK. From the perspective of sustainability, the valorisation of IK, for its own sake, contributes little. One should not conflate IK with sustainability; while there is much evidence to suggest that many forms of local knowledge are sustainable in a local context (e.g. Berkes and Folke, 1998), one should remember that these forms of knowledge are locally and culturally specific, and may not be transferable to other, broader contexts; or may be symbolically important but practically useless when it comes to solving development dilemmas (Sillitoe, 1998). There should also not be the perception that scientific knowledge will be the magic bullet either, as is clear from the plethora of environmental and social problems arising from the inappropriate utilization of scientific knowledge in the name of development (Kothari, 2002).

The divide that seemingly exists between indigenous and scientific knowledge on epistemological, methodological or substantive grounds has been vigorously debated within the literature (e.g. Kloppenburg, 1991; Agarwal, 1995). Agarwal suggests that such dichotomies should be dismantled, and that IK theorists should focus on the relationship between power and knowledge, and on the ways in which types of knowledge "with differing logics and epistemologies" (1995: 433) oppress marginalised groups, and also how these knowledges can be used to help marginalised groups. To do this it is important to recognise the globally hegemonic nature of western science and technology – the dominant knowledge – and to uncover the ways in which the dominant knowledge marginalizes local knowledge(s), this includes not only the suppression of local knowledge(s), or its cooption and transformation into scientific knowledge (e.g. appropriating IK about medicinal plants for use in the pharmaceutical industry); it also includes an acceptance that local or indigenous people can think scientifically, and may even appropriate scientific knowledge for their own purposes – something the empirical evidence of this thesis will demonstrate.

One theoretical perspective that has influenced this thesis is Kothari's (2002) concept of Subaltern Knowledge (SK). This describes a theoretical stream of knowledge studies that explicitly aims to redress the power imbalance that exists between western scientific knowledge and local knowledge(s). The use of the word subaltern is a ploy designed to emphasise not only the marginalisation of local knowledge(s) but also the potentiality of resistance that lies within these knowledges. Kothari refers to a praxis of SK wherein the embeddedness of power and domination in knowledge processes are brought to the fore and transformative spaces are created for the alteration of power relations. As Kothari states, this agenda is "overtly and necessarily political in exactly the opposite way in which science, when it invalidates Local Knowledge, is political" (2002:226), in that "its emphasis is on altering power relations in a way that empowers the subaltern via their own knowledge(s) and through strategically employing the knowledge of others to their own advantage" (2002:232).

Kothari's work draws heavily on the work of Freire (1970), particularly his notion of *Conscientizacao,* a process through which people come to appreciate the nature of their own social, political and economic oppression, and work to transform that oppression. Freire's pedagogy was designed to inculcate oppressed people with this sense of critical awareness, which would provide them with the tools to pursue their own freedom. Freire describes the dehumanisation of the oppressed, their sense of inferiority and fear of freedom, and the prescriptive and coercive relationships between the oppressor and the oppressed, relationships which are not immediately obvious. Freire's work aims to radically transform the conditions of oppression and marginalisation by allowing people to regain their decision-making capacity and turn themselves from 'Objects' ('Objects' of science and technology for example) into self reflective and responsible 'Subjects', who can critically intervene and shape their own reality.

Before moving on to discuss the marginalisation of the Filipino farmer, I think it is important to briefly outline the relationship between the three major concepts introduced in this chapter (i.e. transformative participatory development, context-dependent social capital and subaltern knowledge). I would suggest that the most important principle for the realisation of sustainable agriculture is that of transformative participatory development. As this thesis will suggest, the power to change the social and political conditions which inhibit the local realisation of sustainable practices is of primary importance. This principle is of a higher order than both SK and context-dependent social capital, which I would argue, are necessary but not sufficient conditions for TPD. For example, the realisation of TPD is dependent upon a rise in critical consciousness – there must be some sort of recognition on behalf of the Subject that oppressive conditions exist, and an understanding of the nature of these conditions. This type of realisation is very personal and acts, in the first instance, at the level of the individual. The scaling up of this critical consciousness and the accompanying desire to act at a higher level to address oppressive conditions is where the instrumental use of bracing social capital becomes important. Within this context, social capital becomes a transformative tool that can help raise the critical consciousness of a common group of people (e.g. resource poor farmers), help establish links between groups with similar concerns, and help those with limited resources achieve their development goals. The development of this individual and collective capacity needs to be encouraged by establishing truly empowering political conditions as well, such as those outlined in the citizenship approach discussed above.

Subsequent chapters of this thesis will address many of the issues raised by the SK, TPD, and context-dependent social capital perspectives. For example, chapter 5 will describe the epistemological, political, social and economic marginalisation of the Filipino farmer through an analysis of governance, land reform, and the impact of the green revolution in the Philippines. Chapter 9 will discuss the attempts by some CFPRA farmers to reinvent their farming systems within this overall structure of marginalisation, and chapter 8 will discuss the rise of the critical awareness these farmers have experienced since their involvement in the CBDC project. The social transformatory conditions for sustainable rice production in Campagao (including elements of the three concepts introduced above) will be discussed at length in chapter 11.

5. Farmer last: the marginalisation of the Filipino farmer

The three previous chapters introduced some theoretical concepts and perspectives that have influenced my conception of the sustainability problem (i.e. human ecology, agroecology, transformatory participatory development, context-dependent social capital and subaltern knowledge); these will form the theoretical basis of my forthcoming analysis of the empirical material. However, before I introduce the empirical material, I think it is important to discuss the historical and political context of agricultural production by resource poor farmers in the Philippines. The following chapter will outline the political, socio-economic and epistemological marginalisation of the resource poor Filipino farmer through an analysis of governance in the Philippines, successive governments' land reform programs, and the nation's green revolution.

Within this thesis I use the term marginalisation to refer to the systematic discounting of the interests of resource poor farmers, as well as the associated discounting of farmer knowledge and innovation, i.e. a lack of appreciation of the role resource poor farmers can play in agricultural development as knowledge bearers and innovators.

The analysis of governance and land reform will highlight the political marginalisation of resource poor farmers and the landless in the Philippines, focussing in particular on the inequities that exist in relation to political representation and landownership. The analysis of the green revolution will highlight the socio-economic and epistemological marginalisation of the resource poor Filipino farmer. It will be argued that the nation's green revolution contributed significantly to this socio-economic marginalisation, through the use of unsuitable high input systems of agricultural production, and the related changes in social and economic circumstances that accompanied the new technology. These technological changes also represented an epistemological marginalisation of the Filipino farmer wherein the valuable local knowledge of farmers was excluded in preference to reductionist-technological knowledge, in order to achieve the agricultural development goals of the state – goals that were at odds with those of poor farmers. The following discussion will highlight two recurrent themes in agricultural development in the Philippines, namely a fixation with reductionist-technological solutions to complex social problems, and the prioritisation of the interests of the nation's elite, foreign powers and corporations over the interests of resource poor farmers.

5.1 Governance in the Philippines

While the Philippines is a democratic state with freedom of expression and universal suffrage, and while it has not been subject to overt military dictatorships like some other countries in southeast Asia, there is a particular form of electoral democracy present in the Philippines that, it will be argued, favours elites at the expense of the poor. In this section I will discuss governance in the Philippines with particular reference to the nature of corruption in the country, the weak state hypothesis, the ubiquity of Patron - Client relationships, and the important role civil society plays in political life in the Philippines.

5.1.1 The nature and origin of corruption

An unfortunate characteristic of governance in the Philippines is the way in which those with social and economic power, e.g. local elites, are able to access political power, and all too often, exploit this power for their personal gain. Corruption, or the cooption of political power for personal gain (Transparency International, 2003), is a recurrent theme in Philippine politics, as the cases of former presidents' Marcos and Estrada attest. According to Varela (1995) [cited in Quah, 1999] "...graft and corruption reached its all time high during the martial law regime under Marcos," as corruption "had permeated almost all aspects of bureaucratic life and institutions which saw the start of the systematic plunder of the country".

Theories relating to the origin of corrupt practices by government officials tend to focus on the behaviour of the nation's colonial rulers. A legacy of Spanish and American colonial rule was the restriction of access to political power to regional elites (Scipes, 1999; Sidel, 1997). This restriction of access originated during Spanish colonial times, when only those favoured by the Spanish colonial administration were allowed to participate in elections (Rivera, 2002), and continued throughout the American colonial period (Boyce, 1993; Scipes, 1999, Rivera, 2002). During this period, local elites vied for political power through representative electoral contests, and the victors of such contests further entrenched their power, and also used the public resources available to them to win elections; this, in turn, encouraged patronage-driven corruption (Rivera, 2002).

Under Spanish colonial rule corruption also extended to the nation's civil servants, who, according to Corpuz (1957), adopted corrupt practices to augment their low wages. This practice may have been reduced during the American colonial period (1898 -1913) due to the higher salaries paid to bureaucrats (Quah, 1982), but flourished again after World War 2 (Quah, 1999), and continues to persist in the Philippine civil service (Padilla, 1995). The empirical material introduced in chapter 5 will discuss the nature of local (barangay) corruption and the forms it takes, and in chapter 9 I will discuss these issues further with reference to the concept of transformatory participatory development.

5.1.2 A weak state

According to Moran (1999), the context for corruption has been provided by patterns within the nation's political economy, most notably the presence of a weak state confronting strong social forces, particularly the power of regional elites. Weak state capacity is influenced by the timing of a country's integration into the world capitalist economy, coupled with the nature of a country's colonial experience (Migdal, 1988). Colonial rulers strengthened the power of regional elites and patron -client networks through favouritism, and at independence these elites resist attempts by the state to extend control over them; however, in order to maintain power, state leaders must implement strategies that ultimately affect their capacity to implement social change. Under these circumstances state leaders engage in the 'politics of survival' wherein they use their appointment powers arbitrarily in order to keep potential challengers weak, at the same time as accommodating local strongmen and capitalists; they essentially allow these strong non-state actors to engage in exchanges with politicians and bureaucrats at a local level, thus undermining the state's capacity to implement social change (Migdal, 1988).

Drawing on the weak state -- strong oligarchy thesis, Moran suggests that "when the Philippine state expanded its control of the economy in the post-war period, the landed oligarchies used this to increase their own power: the core of policy making in Northeast Asian states – state autonomy from powerful social classes – was absent" (Moran, 1999: 577). The weak state hypothesis holds that these landed oligarchies have essentially captured the state (Moran, 1999), as represented by the dominance of the nation's landed elite in elected positions within the Philippines (see Gutierrez, 1992). These independently wealthy clans emerged during the nineteenth century (Rivera, 1991), and have persisted to the present, where their power now permeates all levels of government, and according to Moran "has governed the economic trajectory of the country" (1999: 577).

These landed families use their social power to access state positions and then further their personal interests by turning state bureaucracies into what are essentially fiefdoms (Rivera, 1994). They also demonstrate a high degree of political resilience, which is defined as the capacity to "change political circumstances and adapt to changing situations by modifying, altering, or replacing existing strategies" (Angeles, 1999:670), this includes a measure of political entrepreneurship which is a strategy wherein ones economic (wealth) and social (kinship networks, reputation) capital is converted into political capital in order to "buy votes, gain political patronage or access decision making processes" (Angeles, 1999:670). These elite clans have come to dominate the economic landscape of the Philippines; for example, a study by Docherty (1982) identified 81 families who exercised extensive control over the Philippine economy spread over 10 banking groups.

5.1.3 The patron - client framework (PCF)

The Patron - Client Framework (PCF) is a theory of Philippine politics that focuses on the importance of reciprocal ties between individuals, or so-called dyadic ties (Lande, 1965). These are personalised, affect-laden relationships that link individuals of unequal wealth and power (Sidel, 1997), and as such are a form of linking social capital (see Narayan, 1999). Under the PCF, kinship networks and personal alliances become the basis of political power, and factions are formed as distinct networks coalesce around those with power. However the alliances both within and between factions are unstable and shifting (Hollnsteiner, 1963; Lande, 1965), and as political parties in the Philippines are essentially comprised of these alliances, such shifts change the composition of parties as well as the number of parties in the Philippines (Kerkvliet, 1995).

5.1.4 Beyond the patron - client framework

A reading of the PCF interpretation of the Philippine polity could lead one to think that Philippine politics is nothing more than a grandiose exercise in self interest, the aim being to get as much money and power as possible in order to advance one's self interest and the interest of 'clients'. While this may be generally true, such an interpretation is a narrow one (see Kerkvliet, 1995). According to Kerkvliet (1995), the PCF assumes that the issues and concerns of the individual and the family are primary, and that issues beyond these cares are of little importance; it also assumes that ideological positions and principals are unimportant, and that patron-client relationships are symbiotic and smooth; and critically, it assumes that political struggles are between rival factions composed of people from different socio-economic, class and ethnic backgrounds, and as such it does not countenance the possibility of struggle based on these economic, class and ethnic cleavages.

Kerkvliet's critique is not meant to undermine the importance of the PCF, as he acknowledges there is considerable evidence of the persistence of patron - client ties and factionalism in Philippine politics; what he is trying to do is to demonstrate that other "values, ideas, bases for organisation and cooperation, and cleavages and frictions except those of a personal, familial, patron-client nature" exist (Kerkvliet, 1995:401). Examples of other values and ideas that permeate Philippine political life include those to do with class, status, ethnic, regional, local and cultural identities, as well as ideologies like capitalism, democracy, communism, Marxism, Islam and Christianity, as well as normative considerations about how political life should organised in the Philippines (Kerkvliet, 1995). The history of peasant struggle and rebellion in the Philippines, the dominance of the Catholic Church, the ongoing Islamic struggle in Mindanao, the continuing communist insurgency, and the direct action of thousands of NGOs and People's Organisations throughout the Philippines attest to the influence these alternative ideals have had, and have, in political life in the Philippines.

5.1.5 Civil Society

The above discussion paints a picture of a Philippine polity that is dominated by antagonistic, wealthy, self-interested elites, who use their personal ties to assume and maintain power. These elites may actually have political power or be highly influential politically, and these groups dominate the political process from the local to the national level. This raises questions about the democratic representativeness of these elites. If the majority of those who are in power are there to further their own vested interests, how can they further the interests of their constituents, particularly when those interests may be at odds with their own? And within such a system how do those with little influence manage to make their voices heard?

In Philippine politics, the politically marginalised are forced to use extra-democratic means to express their interests. Opposing the elites are groups from civil society with a broad range of interests, and these civil society groups have been growing in influence since the 1980s, and particularly since the ousting of president Estrada in 2001 (Transparency International, 2003). The Philippines has a vibrant, robust civil society that has often "militantly advanced the social and economic interests of the various disadvantaged sectors" (Rivera, 2002). Some of the more powerful civil society networks include the Makati Business club, which was instrumental in deposing former president Marcos; the Catholic Church; the Philippine mass media, which is amongst the freest in the region; developmental NGOs, and militant groups such as the New Peoples Army. There are some 95,000 NGO groups in the Philippines (Vacek, 1998).

Governance in the Philippine is thus characterised by a polarisation wherein elite groups – who are fighting amongst themselves for political power – retain power at the expense of the politically marginalised, and the politically marginalised, having limited democratic options open to them, use the means available to them (e.g. forming NGOs and Peoples Organisations (POs), insurgency and rebellion) to advance their political desires. Paradoxically, it is the 'weak' nature of democracy in the Philippines that provides the space for such a vibrant civil society (Rivera, 2002). As the Philippine form of electoral democracy favours social elites, resource poor farmers and the landless are effectively ostracized from formal participation in the political system. These farmers are forced to adopt other, extra-democratic means to further their interests, such as joining POs and NGOs, or more radically, joining militant groups such as the New Peoples Army (NPA) or other militant peasant organisations. As we will see in the next section, the Philippine government has, in some instances, taken on board the concerns of resource poor farmers, but the response has been tokenistic and designed to placate the rural poor, not empower them.

5.2 The disingenuous reforms

It is reasonable to be sceptical about the genuineness of land reform policies in a country dominated by self-interested elites, many of whom have large land holdings. In such circumstances, one must ask the question: "why would those who acquired wealth through large land holdings and the exploitation of share croppers and landless labourers undermine their own self-interest by securing tenure for the disadvantaged and redistributing their own lands?" In the Philippines, at least, there is not a simple answer to this question. For example, while fear of insurgency and the self interest of elites has been a motivating factor in land reform, there is no denying that some moderate reform has taken place, particularly in the post Marcos era. This raises questions about the dominance of landed elites, the antagonism that exists between elite groups with different power and wealth bases, the role of genuine reformists, as well as the role of social activists.

While the intention of this section is to demonstrate the limited extent of land reform in the Philippines, and the relatively minor impact it has had on the lives of resource poor farmers and the landless, this analysis is not entirely negative. For example, I will also discuss how landlord resistance has, and can continue to be combated through the positive interaction between reformist forces within state and society. The following discussion will focus on the difficulties and complexities of land reform in the

Philippines; in doing so, it will discuss the nature of landlord/tenant relationships and sharecropping in the Philippines, successive governments' concerns with peasant unrest, the extent of land reform since 1972, and a brief discussion of the barriers and opportunities to land reform in the Philippines.

5.2.1 The Landlord/Tenant Relationship

While the Filipino elite no doubt holds a significant amount of power, the Filipino peasantry should not be thought of as passive or completely powerless; the Filipino peasantry has a long history of both political resistance and violent resistance; as Constantino writes "Filipino resistance to colonial oppression is the unifying thread of Philippine history" (Constantino, 1975:9). This resistance was fuelled by, amongst other things, the oppressive nature of landlord/tenant relations during the colonial era, the onerous nature of which has been well documented (see Crippen, 1946; Constantino, 1975). While these relationships were definitely inequitable, they were mediated somewhat by the reciprocal nature of the patron - client relationship, wherein the landed elite required support from loyal peasants to maintain power and prestige (Kerkvliet, 1977). However, these social bonds began to erode when the colonial administration implemented formal land title registration, which exaggerated the power of the landlords, and, as Kerkvliet states, "whittled away their incentives to serve the community" (1977:22). The formalisation of land title also fuelled rampant land grabbing amongst the elites, which had a detrimental effect on smallholders who were ignorant of the processes of the law (McLennan, 1969). This practice continued under the American administration as local elites used both corrupt and legal means to appropriate land from peasant landowners (Kerkvliet, 1977).

As a result of this blatant land grabbing, the proportion of share tenants in the Philippines increased from 16.2% in 1913 to over 50% in 1960 (Rocamora and Conti-Panganiban, 1975). Share tenancy agreements varied considerably, although a 50:50 ratio was not uncommon (see Kerkvliet, 1977; Fegan, 1979). As my data from Campagao will show, this agreement was a common one in Bohol up until the 1980s, and share tenancy remains a very common form of land tenure, and one that has persisted despite successive governments' land reform programs.

The relationship between landlord and share tenant was, and I will argue, is, one that is based on certain moral obligations, which are generally, as Wolter states "asymmetrical in character" (1984:25). These obligations may include – from the perspective of the tenant – the provision of credit or landlord intervention in disputes, and – from the perspective of the landlord – expectations to undertake unpaid labour or provide political support (Boyce, 1993). There is ample evidence to suggest that the landlord/tenant relationship, under the sharecropping system throughout the Philippines, places onerous burdens on the tenant (see Fegan, 1979; McLennan, 1982), which may include a perpetual indebtedness to the landlord (Boyce, 1993).

5.2.2 Placating the peasantry

The newly independent country's first land reform bill was passed in 1955 by a landlord-dominated Congress, and only applied to individual holdings over 300 hectares, corporate holdings over 600 hectares, or any area regardless of size if "justified agrarian unrest" existed (Frederick and Wells, 1978; Bautista, 1983). The motivation behind this initial attempt at land reform was to placate peasant-based organisations – particularly the *Hukbong Mapagpalaya ng Bayan* (*Huks* – or the People's Army of Liberation). The *Huks* became organised during World War 2 in opposition to Japanese occupation, and after the war became increasingly more radicalised as traditional, oppressive agrarian relations returned, (Kerkvliet, 1977). The *Huks* demanded representation for peasants in the post war democracy and when their demands went unanswered they began a rebellion in Central Luzon, which lasted from 1946 to 1954 (Kerkvliet, 1977). Despite the concern of the government over the *Huks* and other radicalised peasant groups, this initial attempt at reform was resisted by the landowning class and progressed only minimally in areas where peasant unrest was considerable (Bautista, 1983).

The sceptre of peasant unrest – this time by communist insurgents – also influenced President Marcos's 1972 land reform bill, as well as his declaration of martial law (Kerkvliet, 1974; Hawes, 1990). Six days after declaring martial law, Marcos' Presidential Decree (PD) No. 27, proclaimed "the emancipation of tenants from their bondage and transferring to them the ownership of the land they till". However, aside from his attempts to win over the peasantry, he was also concerned with maintaining stability, as this would serve the dual purpose of allowing him to stay in power more easily at the same time as attracting foreign investment (Kerkvliet, 1974). There is also the suggestion that he used the new land reforms to attack his political enemies (Kerkvliet, 1974; Borras, 2001).

5.2.3 The PD 27 and CARP land reforms

The land reform programs of successive Philippine governments have been designed to reduce the inequities of the sharecropping systems, and to legally secure tenure for share-tenants; however the success of these reforms has been marred by a lack of political will, obfuscation by landowning elites, and chronic problems with implementation. The following discussion will focus on two modern land reform programs, namely Marcos's Presidential Decree No. 27 from 1972, and the ongoing Comprehensive Agrarian Reform Programs of the Aquino, Ramos, Estrada, and Macapagal-Arroyo administrations.

The Marcos land reforms (PD No. 27) targeted almost one million hectares of rice and corn land for redistribution (Borras, 2001). Under the Operational Land Transfer (OLT) provisions, individual landholdings in excess of 7 hectares were targeted for expropriation and subsequent redistribution to tenant farmers. Owners would receive the equivalent of two and a half year's harvest which would be paid by tenants over 15 years with 6% annual interest. Under the Operational Leasehold provisions, owners with farmland less than 7 ha in size were legally bound to sign lease agreements with tenants, which secured tenancy and fixed rents.

This land reform project was tied to the Marcos government's Masagana 99 program, which aimed to modernise agricultural production through the introduction of new rice technology. In order to access land under the OLT provisions, tenants were required to adopt 'modern farming' practices at the same time as joining a local, government-established cooperative, which, in the event of default by the tenant, would be expected to pay its farmer-members' amortizations to the Land Bank (Kerkvliet, 1974).

In the few years after the reforms, implementation progressed slowly and unevenly (Frederick and Wells, 1978; Bautista, 1983, Riedinger, 1995), and was marred by aggressive landlord resistance and threats to tenants (Riedinger, 1995). Landlord resistance included the filing of baseless court cases, the denial of water rights, the eviction of tenant's relatives from the tenant's residential lot, a failure to participate in the land valuation process, as well as the physical intimidation of tenant beneficiaries (see Fegan, 1979; Riedinger, 1995). This intimidation included the use of private armies to harass peasants who applied for or advocated land reform, the eviction of tenants from farmland, and the destruction of property (Kerkvliet, 1974). Apart from these overt tactics, landowners also used more subtle means to avoid the land reform laws, such as subdividing land among their children in order to fall under the 7 ha threshold, subdividing lands for residential lots, and mortgaging lands to associations or corporations not affected by land reform laws (Kerkvliet, 1974).

Despite landlord resistance a limited amount of land redistribution was effected. Deininger *et al* (1999) estimate that by 1985, 500,000 households had benefited from the operational leasehold component of the reforms; however only 17,116 beneficiaries (3% of the target population) on 11,197 ha had received emancipation patents under the OLT provisions (Riedinger, 1995). The problem with the OLT provisions was that the certificate of land transfer (CLT) provided to tenants was not actually a title to land, it simply gave the tenant the right to purchase the land claimed over 15 years at 6% interest per annum. Tenants were also required to pay land taxes, and to give 5 pesos per month and one *cavan* (approximately 40 kilos) of rice to a government-sponsored cooperative, not to mention the requirement to use 'modern' farming practices (Kerkvliet, 1974).

Needless to say these provisions favoured those farmers who were economically viable to start with (Bautista, 1983), including those with larger farms and political connections within the village (Barker, Herdt and Rose, 1985). The issuance of CLTs themselves was also delayed by disputes over land valuation (Bautista, 1983;

Riedinger, 1995; Deininger *et al*, 1999), while the conversion from share tenancy to leasehold was delayed due to the need for Department of Agrarian Reform (DAR) staff to identify lands that should be transferred from share-tenancy to leasehold, instead of automatically converting those lands (Deininger *et al*, 1999); chronic budget shortages and problems within the DAR bureaucracy also affected implementation (Wurfel, 1983). There was also evidence that DAR staff were affected by political pressure and often brokered agreements that were less than favourable to tenants (Major Religious Superiors, 1973).

The disingenuous nature of these reforms became evident when the ceiling of 7 ha for operational land transfer was extended to 25 ha in 1973, a ploy, according to Kerkvliet (1974), intended to placate middle class landowners, many of whom were in the military. This, coupled with the fact that PD 27 covered rice and corn land exclusively, meant that only 16% of the tenant population could benefit from the new land reform provisions (Kerkvliet, 1974).

However, the most obvious shortcoming of the Marcos reform was its complete neglect of landless agricultural labourers (Kerkvliet, 1974) who are probably the most numerous, as well as one of the most disadvantaged sectors of Philippine society (Boyce, 1993). All told, these reforms did little to address issues of inequality in land distribution; for example in 1985, 13 years after PD 27 was enacted, 2.2 to 2.8 million of the roughly 4.4 million agricultural families in the Philippines made their living either entirely or partially from land they did not own.

In the mid-to-late 1980s after 14 years of authoritarian rule, the Philippine government was genuinely concerned with the increasing insurgency and the possibility of violent revolution. The National Democratic Front (NDF), the body coordinating revolutionary activities in the Philippines at that time, reported that it was active in 69 of the country's then 73 provinces, with over 20,000 armed fighters mainly from the ranks of the NPA (Hawes, 1990). While the ascension of Corazon Aquino to the presidency brought with it some hope of reconciliation between the government and the revolutionary forces, she was unable to broker an effective amnesty, and fighting between the NPA and the government, and paramilitary groups - as well as the assassination of government officials – continued at increased levels (Kowalewski, 1992). Total fatalities on both sides during 1987 were estimated at 10 per day (Hawes, 1990).

The failure of the Marcos regime to implement significant agrarian reform and to address the inequalities present in the countryside provided fertile ground for the expansion of the insurgency (Hawes, 1990; Kowalewski, 1992; Putzel, 1992). The extent of inequality in relation to land ownership was highlighted by the Aquino government's *Listasaka* land registration program of 1988, which demonstrated that 5.8% of Philippine landowners owned 3.8 million hectares of land, which was almost 50% of the land reported under that program – this represented only 1.5% of all rural families (Putzel, 1992).

Faced with this stark inequality and growing insurgency, the Aquino administration, after some heated debate between liberal and conservative forces within the government (Putzel, 1992), introduced the Comprehensive Agrarian Reform Program (CARP) in June 1988. The program initially covered 10.3 million ha of land out of a total agricultural area of 11.28 million ha. The programs coverage was subsequently reduced to 8.064 million ha in 1996 after a data 'clean up' campaign (Borras, 2001). Rice and corn lands over seven hectares were to be targeted for redistribution and leasehold arrangements were to be implemented on lands under five hectares. The five ha retention limit for non rice and corn land also included a provision wherein three hectares of land could be distributed to the offspring of landowners provided certain qualifications were met. On paper, these reforms were a significant improvement over the Marcos reforms because they included land other than rice and corn land and would therefore, in theory at least, benefit many more farmers.

The CARP covers all privately owned lands including export croplands; it also covers government owned lands, military reserves, and public lands. These lands were to be redistributed over a ten year period in three phases starting with rice and corn lands, idle abandoned lands, and voluntarily offered private lands, in phase one, to large landholdings up to 50 hectares in phase three. A number of mechanisms were employed to effect redistribution; these mechanisms were based on the principle of 'just compensation'. Modes of acquisition included: the utilisation of the OLT scheme, which was introduced during the Marcos reforms for rice and corn lands; a Voluntary-Offer-to-Sell (VOS) which rewarded landlords with a 5% increase in the cash portion of their payment if they voluntarily offered their land for sale; a Voluntary Land Transfer (VLT) arrangement, which enabled land to be directly transferred between landlord and tenant on terms agreed between the two parties; the Compulsory Acquisition (CA) of land regardless of a landlord's cooperation; and the Stock Distribution Option (SDO), wherein large corporate farms were exempt from expropriation if the owners entered into stock sharing arrangements with farmer beneficiaries; this option also allowed for the leasing back of land from the beneficiary to an investor under certain conditions.

However, the implementation of the CARP under the various Philippine administrations has been haphazard. While the redistribution of lands began slowly under the Aquino administration (1986 -1992), redistribution output improved significantly under the leadership of President Ramos (1992 -1998) before stalling again under the Estrada administration (1998 -2001), as Table 5.1 demonstrates. At the end of 2001, a total of just over 3 million hectares of land (approximately 40% of the land targeted) had been redistributed.

Table 5.1: Yearly Land Distribution Output 1988 - 2001 (hectares) (Source: Borras, 2002)

1988	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**
135,693	111,665	183,062	279,882	260,020	407,680	433,678
1995	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
289,324	300,195	210,126	137,358	132,069	110,478	107,224

While the above figures sound impressive, the implementation of CARP up to and including the Arroyo administration (2001–) has been tainted by the same type of disingenuousness, corruption and elite resistance that characterised the Marcos reforms. Examples abound wherein the modes of acquisition that were employed to reduce opposition from landlords (e.g. VOS and VLT) have actually encouraged corruption on massive scales (Borras, 2002). For example, there have been problems with corruption arising from the collusion between landlords and DAR officials in the valuation of land under the VOS provisions, which was facilitated by the way in which the Declared Market Value (DMV) of land was calculated, and has resulted in inflated prices being paid to landlords (Putzel, 1992). One of the most alarming cases was in Mindanao, where the Philippine government seems to have paid more than PhP 2 billion for non-existent land (see Borras, 2002). Similarly, the VLT scheme has been described by Borras (2002) as the worst type of land acquisition and distribution scheme, because it facilitates fake land transfer which, again, result from the collusion of landlords and DAR officials.

The Stock Distribution Option has also been subverted by large landholders and multinational corporations who have used loopholes in the SDO provisions to maintain control of large estates or to lease those estates back from 'favourable' former tenants at reduced rates (see Putzel, 1992; Borras, 2001; Borras, 2002). The most famous case involved President Aquino herself and her 6,431-hectare family estate *Hacienda Luisita*. Using a variety of techniques including transferring agricultural land to other uses, and inflating the value of non-land assets, the family company managed to maintain control of two-thirds of the estate, and distribute stock equivalent to one third of the company's total value to former workers. As Putzel asserts, this effectively violated the redistributive essence of CARP (Putzel, 1992), and "created a deeply negative atmosphere for the cause of agrarian reform" (Borras, 2001: 542).

As the above evidence suggests, the CARP, while quite comprehensive in scope, has been characterised by the same type of disingenuousness that was witnessed under the Marcos reforms, wherein the essence of redistribution, i.e. a desire to create a more equitable society through the redistribution of land from the wealthy to the poor, has been subverted at every turn by corrupt DAR officials, resistant landlords and self interested politicians.

5.3 The green revolution and the reductionist-technological fixation

No other global phenomena more accurately reflects the wholesale marginalisation of resource poor farmers than the green revolution. The green revolution was revolutionary in that it effected great change throughout Asia, with the introduction of new high input crop varieties, chemical fertilisation and pesticides; and this affected everything from social relations within villages to the entire economy of the region. However, these changes were accompanied by something more intangible but equally revolutionary, namely a shift away from a reliance on reproductive local knowledge to a reliance on productive reductionist-technological knowledge.

In order to better understand the impacts of the green revolution, how it came about, and the dominance of its reductionist-technological prescriptions, this section will begin by focussing on the ideology of the green revolution, and how that ideology influenced, and continues to influence, nearly 40 years of rural development thinking. This will be followed by an introduction to the food output/supply paradox and a brief historical account of the green revolution in the Philippines and the inequities associated with it.

5.3.1 The birth of the green revolution

In chapter 4 I discussed the primacy of reductionist-scientific epistemologies in 'development', and in particular how these 'superior' types of knowledge have displaced 'inferior' types of knowledge. In the field of agricultural 'development', the green revolution was one of the most ambitious attempts by the western world to use reductionist science, and its technological prescriptions to 'develop' the 'underdeveloped'. As Anderson *et al* (1991) suggests ".... the green revolution ranks with railroad building in North America and electrification in the Soviet Union as being among the most ambitious deliberate efforts to employ science and technology to effect rapid structural change".

The green revolution was conceived during a time of rampant modernisation, when there was a sharp divide, in the minds of some at least, between 'developed' and 'underdeveloped' nations. This mindset permeated the thinking of the Rockefeller and Ford Foundations (Anderson *et al*, 1991), the two foundations that gave birth to the green revolution. The Foundations, building on the strengths of American agriculture, sought to use a chemical-genetic crop improvement strategy to increase rice yields in Asia (Frossard, 1994). This 'green' revolution was a curious mixture of philanthropy and economic and political opportunism, in that it hoped to address some of the numerous problems facing the citizens of the 'underdeveloped' world, at the same time as benefiting the United States. For instance, it was thought that by increasing production, the twin problems of economic stagnation and political instability could be addressed (Frossard, 1994). A solution to both these problems was politically attractive to the United States, which hoped an increase in the purchasing power of the poor would vastly expand market opportunities for the US (Anderson *et al*, 1991), and in particular the export prospects for American agribusiness (Cleaver, 1973), while addressing the issue of political destabilisation would help curtail the spread of communism in Asia (Feder, 1983). As Boyce rightly states, the green revolution was a "historically unprecedented attempt to transform Asian rice agriculture through conscious intervention from above" (1993:61).

In the Philippines this revolution began in 1960 with the establishment of the International Rice Research Institute (IRRI) in Los Banos. IRRI's goal was to produce high yielding varieties of rice suitable for use throughout tropical Asia (Anderson *et al*, 1991). The focus was on increasing production at the national aggregate level, this focus on food output was, as W. David Hopper, an economist with the Rockefeller Foundation, suggests 'the only valid measure' of the new strategy (Hopper, 1968). IRRI set about developing a package of production options based on the chemical-input crop improvement strategies employed in the U.S. This package consisted of the breeding of short statured photoperiod-insensitive high input rice varieties, the use of chemical fertilisers, and the use of pesticides to combat weed growth, insects and pathogens.

5.3.2 The ideology of the green revolution

The ideology of the green revolution has been comprehensively described in three papers: Dove and Kammen (1997), Yapa (1993), and Koppel and Oasa (1987). Dove and Kammen focus on uncovering the epistemological characteristics of sustainable systems of resource use; in doing so they compare and contrast three systems of production: the green revolution, the mast fruiting of dipterocarps in the forest of Borneo, and the swidden system of the Dayak people in Borneo. Unlike other commentators who have focussed on the economic, social and ecological impacts of green revolution technology, Dove and Kammen focus instead on the ideological shortfalls of the green revolution, and they suggest that "the real significance of the green revolution is conceptual not technological" (1997: 92). According to Dove and Kammen, the sustainability or otherwise of a system of resource use is predicated upon its ideological basis, and this ideological basis consists of three things: its systemic understanding, its concepts of exchange, and its scope.

Three things shape Dove and Kammen's systemic understanding of a system of resource use, including the way failure is conceived, whether benefits are seen to incur costs, and whether or not the secondary effects of production are recognised. This, in turn, determines how abundance and scarcity are defined, and how scarcity is dealt with culturally. Dove and Kammen maintain that the green revolution fails to countenance shortfall; instead, the premise is that "bounty is constant and reliable, not periodic and unreliable" (Dove and Kammen 1997:94). This focus on the certainty of production is exemplified by the term 'high yielding varieties', a term which carries with it the promise of high yields all of the time. However, according to Dove and Kammen, failure and shortfall do occur, but green revolution scientists and planners do not associate this with the green revolution prescriptions themselves, but with a farmer's failure to use these technological prescriptions correctly, or with the emergence of new environmental problems. As such, within the green revolution ideology, failure and the means to deal with it are externalised.

The concept of exchange refers to the character of a resource use system's relations with nature, and to co-terminous social exchanges. According to Dove and Kammen, the green revolution system "tries to optimise the difference between what it takes out and what it puts back in, the difference between outputs (crops) and inputs (fertiliser)" (1997:96). Within the ideology of the green revolution, the reciprocal relationship with nature that underpins more ecological approaches to agriculture is absent. In relation to social exchanges, Dove and Kammen suggest that the green revolution ideology denies local fluctuations, and as such, "avoids the responsibility to build in exchange with the local sphere that must absorb its costs and justifies its emphasis on extra-local exchange" (1997:97). This extra-local exchange is an integral part of the green revolution which relies entirely on market inputs (e.g. fertilisers, pesticides, seeds) and the marketing of outputs (agricultural produce). This reliance on extra-local exchange narrows the opportunities available to farmers who use green revolution technologies, as well as creating local scarcity of inputs and outputs.

According to Dove and Kammen, the scope of a system of resource use refers to two things, namely its spatial scope and its consideration of the non-technical aspects of the agricultural system (e.g., moral consideration of the environment, the social impacts of technology, the importance of local knowledge). Dove and Kammen maintain that the green revolution had a myopic scope that focused on increasing food production throughout Asia, and introducing technology to that end. They further maintain that this focus on technology was driven by four important green revolution actors: firstly, politicians who were interested in promoting technological change, instead of dealing with more complex issues of social change; government bureaucracies, who were interested in extending control over rural populations; international agribusiness, who were interested in stimulating demand for their products; and international scientists interested in undertaking research without the burden of social and political responsibility. As the previous discussion makes clear, the green revolution, in Dove and Kammen's conception, was not only a social and technological revolution, but a conceptual revolution, and one driven by an ideology that effectively narrowed the scope of agricultural development concern to the provision of appropriate technology.

Yapa (1993) is interested in the causes of poverty, and contends that modern poverty is a form of development-induced scarcity. He analyses the epistemology of the green revolution through a discussion of the nature of improved seeds, and describes the scarcity created by the promulgation of these seeds during the green revolution. Yapa draws on Marx's concept of production relations in his analysis of the nexus of production relations surrounding improved seeds. This web of relations is comprised of technical, social, cultural, ecological, and academic characteristics, which act together to determine production. Using this nexus one can see that improved seeds have not only technical but social, cultural, ecological and academic characteristics; however the non-technical aspects of seeds have largely been ignored by the epistemology of the green revolution; as Yapa says "the seed is an indissoluble nexus of relations but it was improved, bred and studied through an epistemology of ahistorical, subject specific disciplines and paradigms" (1993:255).

Yapa contends that, within the green revolution epistemology, seeds were conceived of as a purely technical solution to the problem of food scarcity. This thinking was influenced by the diffusionist paradigm, which according to Yapa underpinned the green revolution. Within this conception, underdevelopment is caused by the inadequate development of production forces, and this can be rectified by the diffusion of technological innovations, capital and know-how. Yapa suggests that during the green revolution this diffusion took place without any serious consideration of the social impacts the new innovations would have, or any consideration of the way in which innovations are filtered through society. This was important because "interpersonal economic differences and class play important roles in determining who adopts what in rural areas of the third world" (1993: 259).

Conceiving of seeds in a purely technical context meant no serious consideration was given to the ecologically deleterious impact of High Yielding Variety (HYV) seeds, and the chemicals one was required to use to optimise their production; these impacts include second generation pest attack, genetic vulnerability, the degradation of the paddy resource base, and a loss of knowledge as to alternative sources of biological nitrogen. According to Yapa, the introduction of improved seeds provides a fine example of the social construction of scarcity, as 'free' resources (i.e. local varieties of seeds) and the knowledge required for their reproduction, are replaced by industrial seeds, which are now the intellectual property of the corporations that produce them. This results in a loss of local knowledge and, as Shiva (1991) has suggested, the replacement of the reproductive capacity of local agriculture with the productive capacity of industrial agriculture.

A purely technical conception of improved seeds also fails to recognise the culturally hegemonic characteristics of improved seeds. These seeds are created through the use of reductionist science, and as such they represent the primacy of capital and science over local knowledge and tradition, which again highlights the primacy of the productive capacity of industrialised agriculture, and the subversion of local knowledges and traditions. The cultural marginalisation accompanying the promulgation of improved seeds occurs because "the diffusion of improved seeds is also the diffusion of a new culture, one that devalues the production of subsistence and erodes the principle of local reproduction by creating a need for external inputs" (Yapa, 1993: 267).

Yapa also discusses the social process of science and technology, and suggests that the development of improved seeds benefited certain classes of people, at the same time as legitimising certain social theories and worldviews, and scientific rationality itself. This has led him to assert that science, as a social process, cannot be considered value-free. Improved seeds were, and are, seen as the expression of scientific rationality and technical progress, and any critique of them is essentially a critique of the legitimacy of these two notions. This also extends to critiques of other supposedly rational endeavours such as 'development' and 'modernisation', and has created, as Yapa states "a whole new vocabulary that included terms and expressions such as 'backward farmers', 'progressive farmers', and 'betting on the fittest'" (1993:269). These divisions, in turn, influenced development thinking for many decades, and contributed to the marginalisation of 'backward' farmers, who may have had (and still have, as we shall later see) rational reasons not to adopt improved seeds.

The notion of value-laden science was certainly not a characteristic of green revolution ideology itself which, according to Koppel and Oasa (1987), can be described as an 'ideology of neutrality' (Koppel and Oasa, 1987). This ideology of neutrality extended to agricultural research itself, i.e., agricultural research was not accountable for the outcomes of the technologies it produced. It also extended to the nature of the technologies, which according to green revolution scientists and planners did not favour anyone, but were themselves favoured by rational resource allocation. Koppel and Oasa describe the primacy of Induced Innovation Theory (IIT) as an interpretation of how green revolution technological change, institutional change and policy would interact. This theory focuses on the way in which factors of production are allocated by farmers based on their relative scarcity, and thus their price; within this conception, the role of agricultural research was to "simply follow what market forces revealed." (1987:39). According to Koppel and Oasa, IIT was a major driver behind the work of the world's major international agricultural research institutions and IRRI in particular, whose programs were described by Ruttan (1978) as the primary example of induced innovation.

The foregoing discussion describes an ideology that is techno-centric, culturally hegemonic and ignorant of the social and ecological ramifications of its technical prescriptions. While this ideology no doubt helped green revolution proponents reach their goals of increasing aggregate rice production, it ignored the great cultural, social and ecological diversity that accompanied rice production in Asia. The Green Revolution has contributed to the erosion of cultural forms, rice plant genetic diversity, and local knowledge of rice production. By ignoring the important role farmers with local knowledge can play in agricultural development, and by promulgating a homogenous techno-centric package for rice production, the green revolution epistemologically excluded farmers, as it forced them to rely on the fruits of reductionist-scientific knowledge, at the expense of their own local knowledge accumulated through generations of rice farming in diverse environments.

Alongside this, the green revolution ideology assumed that farmers should only use the results of scientific knowledge and experimental procedures, not manipulate that knowledge and those procedures for their own purposes, i.e. farmers should understand how and why to use certain technological prescriptions correctly, but could not use the scientific knowledge and experimental procedures that produced those prescriptions. As Frossard (1994) correctly states, this is also a form of epistemological exclusion, and one that Frossard's work and my forthcoming discussion of the experimental trials of CFPRA farmers refute.

5.3.3 The food output/supply paradox

There is no doubt that green revolution technology contributed to an increase in rice production throughout both Asia and the Philippines. This is evidenced by the substantial rise in total rice production throughout Asia and the Philippines despite the relatively moderate increases in harvestable land area, as Tables 5.2 and 5.3 summarise for the period 1961 - 2001.

Table 5.2: Rice production, yields and harvestable area – Asia (1961-2001)

Year	Rice production (000,000 mt)	Av yields (t/ha)	Harvestable area (000,000 ha)
1961	198.778	1.86	106.957
1971	292.171	2.38	122.704
1981	372.517	2.88	129.350
1991	475.335	3.61	131.587
2001	544.296	4.01	135.655

Source: FAOSTAT Database (2004)

Table 5.3: Rice production, yields and harvestable area – Philippines (1961 - 2001)

Year	Rice production (000,000 mt)	Av yields (t/ha)	Harvestable area (000,000 ha)
1961	3.910	1.23	3.179
1971	5.324	1.60	3.332
1981	7.910	2.28	3.442
1991	9.673	2.82	3.424
2001	12.954	3.19	4.065

Source: FAOSTAT Database (2004)

Total rice production throughout Asia increased by 273% during the 1961 - 2001 period, while harvestable land area increased by only 26.8%. Gains were achieved by increasing the average yield per hectare by 2.15 tonnes. Similarly, in the Philippines, total rice production increased by 330% during the 1961 - 2001 period while harvestable land area increased by only 28%, and this was achieved by increasing yields per hectare by 1.96 tonnes. Increases in rice production throughout Asia did vary considerably, and growth was much more prominent in irrigated systems, with little increase occurring in rain fed areas (Hossain and Pingali, 1998). In the Philippines, these increases in rice production have only just managed to keep pace with population growth, and the country has experienced cycles of impressive rice yield growth (e.g. 1965 -1980) (Bautista, 1997), and other periods of relative stagnation (e.g.1989 onwards) (Hossain *et al*, 1996).

However even during periods of impressive growth, increased rice output failed to improve the food security situation of the country's poor. For instance, during the early 1980s, at a time of growing per capita rice production, the Philippines managed to achieve self-sufficiency in rice for the first time since the early 1960s. While this was attributed to the widespread use of the green revolution package, Boyce (1993) suggests that this resulted instead from a lack of purchasing power within the population, "whose hunger" Boyce writes, "could not be translated into effective demand" (1993: 114). Boyce cites a nationwide survey of the Philippine Food and Nutrition Research Institute which found that 67% of Filipino families had insufficient caloric intake, more than half consumed less than 90% of the adequate level, and 69% of the country's pre-school children were underweight. As Quisumbing, commenting on the cases of malnutrition during this period of growth states, "[O]ne cannot explain the prevalence of malnutrition in a period of increasing food and agricultural production and so-called aggregate food 'sufficiency' as primarily a supply problem. Rather, it is a case of the uneven distribution of the available food within the population" (Quisumbing 1987:17).

The assumption that increased food output would automatically improve the food security of the poor in Asia was a central tenet of the green revolution, and was considered the only effective measure of its success. And at first glance one could argue that this goal was achieved. For example, between 1970 and 1990, the first two decades of major green revolution advances throughout the world, the total food available per person in the world rose by 11%, while the estimated number of hungry people fell by 16% from 942 million to 786 million (Rosset *et al*, 2000), despite population growth. As much of this population growth took place in areas where green revolution technologies were promulgated, it might seem that the green revolution was successful in reducing the total number of hungry people. However, as Rosset *et al* (2000) suggest, if one eliminates China from the equation, then the actual number of hungry increased from 536 million to 597 million people; in China the number of hungry dropped from 409 million to 189 million in two decades, begging the question was it the green revolution or the Chinese revolution – which focussed on land redistribution – that was more effective at reducing the total number of hungry?

The point is that despite the increases in food output that accompanied the green revolution, hunger and malnutrition persist throughout the Philippines. For example, subsistence incidence remains quite high in the Philippines, at 13.1% (NSCB, 2003). Approximately 2 million Filipino families fit into this category. This figure is variable throughout the Philippines, and ranges from as low as 4.2% in Batanes province to a high of 42% in the poverty stricken Masbate province (NSCB, 2003).

Based on an analysis of population pressure, intensity of cereal production and the satisfaction of energy needs, the Philippines is considered, along with countries such as Vietnam, Bangladesh and Nepal, as being at a high risk of food insecurity (Hossain and Pingali 1998). This is primarily due to a lack of land for further cereal production, declining growth in rice yield, continuing population growth, and a lack of purchasing power in the population (Boyce, 1993; Hossain and Pingali, 1998). These factors have lead to the Philippines importing significant quantities of rice, and providing cheap rice to the populace through government programs, and this may continue in future years, due to the fact that the yield gains derived from reallocating land from low-yielding traditional varieties to high input varieties are now exhausted (Hossain *et al*, 1996). However, the increases in rice yield growth called for by pundits of the biotechnology revolution may not improve the food security situation in the Philippines, because as Rosset *et al* (2000: 53) suggest, "if the poor don't have the money to buy food, increased production is not going to help them".

5.3.4 A brief introduction to green revolution agricultural policies in the Philippines

In the early 1970s the Marcos administration had numerous political motivations for adopting a productivity-based rural development strategy. These included increased pressure from urban consumers to lower the price of rice, a concern with political instability in rural areas, and a desire for national self sufficiency in rice production (Boyce, 1993). A yield-based increase in rice production was favoured over further extension of areas under rice cultivation because the priority given to export crops limited the land area available for rice cultivation (Boyce, 1993). Considering he had just declared martial law, Marcos was in a position to substantially reshape rice policy in the Philippines, and he did this through unprecedented government intervention in agriculture. These controls included imposing levies and charges on agricultural commodities, and directly controlling the domestic production, processing, distribution and international trade in agricultural commodities (Balisacan, 1998).

In 1973 Marcos introduced the Masagana 99 program, which had the goal of increasing the country's average yield to 99 cavans per hectare (a cavan is a volume of rice equivalent to about 40 kilograms). This program included the provision of a subsidised package of HYV seeds and chemical fertilisers and pesticides, as well as collateral-free loans to farmers who adopted the new package at the relatively low interest rate of 12%. The Masagana 99 program was funded with the help of a PhP77 million loan from USAID (Kerkvliet, 1974), as well as substantial loans from the World Bank and the Asian Development Bank for the construction of large irrigation projects. In 1973 alone, the program provided loans totalling PhP375 million to 391,175 farmers (Kerkvliet, 1974). These loans were intended to provide farmers with the financial resources to purchase the package's expensive inputs. As a result of this program substantial increases in fertiliser use – up from 53,000 tonnes in 1966, to 344,000 tonnes in 1979 were recorded (Herdt, 1987).

When Marcos was eventually deposed, the Aquino administration adopted a more market-orientated, deregulated approach to agricultural development, focussed on the phasing out of price controls, subsidies, and levies and taxes on agricultural inputs and outputs (Balisacan, 1998); this signalled the end of the Masagana 99 program. The agricultural development programs of both the Aquino and Ramos administrations focussed on the provision of appropriate technology, and providing the right economic incentives, as the rationale for the Ramos Government's Grains Production Enhancement Program alludes to:

> If options (i.e. technology and services) are within reach of farmers, enabling them to make rational decisions, then they will be able to transform such economic incentives and opportunities into increased harvests and incomes. Thus, appropriate technologies and needed support services serve as potent vehicles for farmers to achieve economic and social progress, and for the country to attain food security. (GPEP, 1996).

5.3.5 The inequities of the green revolution in the Philippines.

The Philippine Government's green revolution programs, coupled with the previously mentioned land reform measures, were the country's primary rural development strategies from the late 1960s until the early 1990s. However, as a development strategy, the green revolution in the Philippines was seriously flawed. Theoretically, the introduction of green revolution technologies into the countryside was supposed to benefit consumers, producers and labourers through an increase in the demand for labour (Barker, Herdt and Rose 1985), an increase in labour productivity (Das, 1998), and cheaper rice prices for consumers (Boyce, 1993). As the poor spend a significant proportion of their income on food, the argument followed that they would benefit from cheaper rice prices, farmers would gain from increased yields and greater labour productivity, and employment and wages in the agricultural labour sector would increase. However, while there is evidence that the green revolution did lower rice prices, thus favouring consumers (Herdt, 1987), it seems the benefits for landless labourers and resource poor farmers, in particular, were not forthcoming.

For example, despite early increases in labour demand, the average real wage in Philippine rice agriculture actually fell by 25% in the two decades following the introduction of HYVs (Boyce, 1993). These wage decreases were most prominent in areas with rapid yield growth (Boyce, 1993). Regional wage variations were also quite marked, and this had the effect of encouraging migration from low income to high-income areas (Boyce, 1993). Many of these landless labourers originated from the Central Visayas region and formed a new class of poor labourers in the rice growing regions of Central Luzon (Fegan, 1979). Herdt's analysis of 15 years of data from the 'Laguna Loop' survey (1966 -1982) indicates that, despite the widespread planting of HYVs, and an increase in rice production per hectare of 92%, the real wages of agricultural labourers showed 'no dramatic change' (Herdt 1987: 348).

The green revolution technologies were supposed to increase labour demand by up to 20% (Barker, Herdt and Rose, 1985), due to the application of additional inputs and the advent of double cropping, and this was indeed the case in the Philippines until the mid 1970s (Boyce, 1993). However, in the Philippines at least, it seems that the labour absorbing potential of the green revolution package was negated by the subsequent introduction of tractors, power tillers and herbicides, which tended to displace labour (Boyce, 1993).

The green revolution in the Philippines also exacerbated existing inequities by favouring farmers who had large landholdings and access to credit and irrigation. For example, the Philippine government's Masagana 99 program provided low interest loans to farmers who adopted 'modern' farming techniques; however, these loans were largely unavailable to resource poor farmers who were unable to fulfil the loan criteria, i.e. membership of a cooperative and the use of 'modern' farming techniques. As a result, 73% of farmers operating on less than 3 hectares shared in only 1.6% of Masagana 99 production loans (Po, 1980). Further these loans deepened rural inequality in four ways. First, the landless were exempt from loans. Second, farmers with irrigated land were targeted over those with rain fed land. Third, of those who were eligible, people with political and banking connections were favoured. And finally, up to two thirds of the total subsidies available through the program were pocketed by local banks (Boyce, 1993).

Bautista's (1997) survey of the income and equity effects of the green revolution from 1965 to 1980 also demonstrates a bias towards resource rich farmers. Bautista demonstrated that, while productivity and incomes increased during this period, those with larger farms accrued larger income benefits in comparison with smaller landholders, thus producing a negative equity effect. According to Boyce (1993), this differentiation is explained by the Early Adopter vs. Late Adopter thesis. This thesis holds that when a technology spreads, those who are late in adopting it are not simply left with unchanged incomes but with declining incomes, and those who adopt the technology first, i.e. those with access to credit, land and irrigation, accrue the benefits of that early adoption by reaping above-normal profits. However, as output increases, prices decrease, and when input prices also increase, due to growing demand for inputs, profit margins return to normal. But in the interim, those who lag behind experience a decrease in real income as the price they receive for their rice decreases. Boyce also discusses the role of power effects, which again favour early adopters over late adopters and gives them the 'advantage in contests over endowments, externalities, public goods, market power and government policy' (1993:138).

The cost - price squeeze that accompanied the green revolution, particularly after the oil crisis in 1974, may have adversely affected late adopters, but it definitely benefited agricultural service providers. The increase in input prices during the early 1970s and 1980s was substantial. For example, between 1976 and 1981, wages rates increased 207%, fuel prices increased 260%, and fertiliser and pesticides increased 126%; during the same period the price for rice and corn increased by only 44%. (Vargas *et al*, 1998). This increase in input prices, coupled with the fact that many farmers could not access cheap government credit through the Masagana 99 program, indicates that those who really benefited by the green revolution in the Philippines were those who provided agricultural services such as rice marketing and the provision of credit and fertilisers. Umehara (1983), in his study in Central Luzon, found that between 1970 and 1978, the farmers' share of rice paddy output fell from 36% to 16%, while the share of the 'dealer/contractor/moneylender' rose from 15% to 42%.

The role of non-farm income in rural disparity has also been documented by Estudillo *et al* (2001) in their study of household income changes in 5 villages during the period 1985 -1998. This study suggests that the unequal distribution of non-farm income is the key determinant of rural inequality in the Philippines, not the presence or absence of technology, or the type of land tenure. They suggest that education is the key variable influencing non-farm income, and that rural development strategies should focus on increasing educational opportunities and human capital potential.

5.3.6 The marginalisation of the resource poor Filipino farmer – concluding remarks

The foregoing discussion has highlighted the entrenched political, socio-economic and epistemological marginalisation of resource poor farmers in the Philippines. In the political arena, the nature of electoral democracy in the Philippines, and the dominance of social elites, prevents resource poor farmers and others without social power from participating as citizens in the polity. As a result, those marginalised by this system have had to resort to other means to represent their interests, and this includes militancy. In relation to epistemology, the green revolution experience demonstrates that the knowledge resource poor farmers possess was dismissed in favour of reductionist-technological knowledge. Indeed, as a result of green revolution ideology, this knowledge and the farmers who possessed it came to be referred to as 'backward'. In relation to social and economic relations, it was clear that the interests of resource poor farmers were discounted in favour of the interests of foreign powers, urban consumers, and social and commercial elites.

While it may seem that the interests of the poor and marginalised were considered by successive Philippine governments – as evidenced by the mediocre success of the country's land reform programs – one has to question the motivation behind these programs. The review of land reform indicated that placation, not redistribution, was the real motivation behind land reform, and the massive scale of landlord obfuscation – even extending to former presidents – undermined the redistributive ethic of these measures.

This section has highlighted two points that form a key part of this thesis. Firstly, in relation to the issue of power, the analysis of governance and land reform highlighted the fact that the Philippine government and those oligarchies that have essentially 'captured the state' have no intention of empowering the Filipino peasantry. However, the vibrant nature of civil society in the Philippines, and the antagonistic nature of Philippine politics, provide avenues within which the interests of the politically marginalised can be promulgated, provided these disparate groups are organised.

Secondly, it is clear that the Philippine government prefers simplistic technocratic solutions to complex social problems. In the case of the green revolution, existing social inequities were ignored, and the imposition of a technocentric development package in this stratified social context further exacerbated those inequities. This program of increasing food production at the aggregate level was a technologically determinist solution to the very complex problem of agricultural development. The Philippine government's land reform programs also suffered from a surfeit of sociological and political ignorance, i.e. ignorance of the importance of social bonds, and the determination of the landed elite not to give up power. As was clear from the discussion, issues of empowerment and distribution are not addressed through the promulgation of technologies, or disingenuous reforms; they must be addressed with political will and a genuine motivation to improve the welfare of the poor. Until this occurs, resource poor farmers in the Philippines will continue to be marginalised.

6. Barangay life

Having discussed the historical context of agricultural development in the Philippines, and the broader political issues that have influenced development initiatives, I will now move on to describe the local economic, institutional, political, social and environmental conditions that shape and constrain the lives of resource poor farmers in the barangay. I will begin by discussing the socio-economic and geographical characteristics of Bohol province, before introducing the municipality of Bilar and the barangay of Campagao.

6.1 Bohol – A struggling province

When I arrived in Tagbilaran City for my second visit in February 2002, I immediately noticed three things that were different from my first visit two years before: first, the city had grown – more shops, more restaurants and more traffic; second, the pollution from the multitude of tricycles and taxi cabs was now almost unbearable; and, thirdly, there were beggars – mostly young, *Badjao* children carrying naked babies. As with many other provincial Philippine cities, Tagbilaran City is growing – seemingly out of control – and Tagbilaran City is now experiencing all the problems that large provincial cities in Asia face: pollution, fast-paced development, and poverty.

Tagbilaran City is the capital of the island province of Bohol, one of the first islands in the archipelago to be colonised by the Spaniards in the late 16th century, and the site of the famous blood compact between the Spanish sea captain Legaspi and local chief Sikatuna. Historically, the island has been a site of resistance against colonial oppression, whether against the Spanish for 300 years to 1898, the Americans from 1898 to World War 2, or the Japanese between 1942 and 1944. This history of resistance continues to the present, as active NPA cells, scattered throughout the more remote regions of the island, continue their sporadic insurgency against what they consider to be a corrupt and unrepresentative Philippine government. This resistance often takes the form of ambushes and raids on police stations and remote army camps, the assassination of businessmen and landlords, and the destruction of property; and while the conflict is not as intense as it once was in the 1980s and 90s, lives are consistently lost on both sides.

Aside from its peace and order problems, Bohol is facing a series of economic crises. Bohol remains one of the poorest provinces in the Philippines, and is the poorest province in the Central Visayas region, with 56.3% of the population living below the annual per capita poverty threshold (NCSB, 2003). The province also has major trade deficit issues, and suffers from a high inflation rate, low wages, and a consistent annual deficit in rice production – the staple food of the majority of Boholano's (PPDO, 2000). The province's rapid population growth is exacerbating these problems; the current population of approximately 1.1 million is expected to double by 2023, and grew at a rate of 2.95% between 1995 and 2000 (PPDO, 2000).

Bohol is situated in the Central Visayas region of the Philippine archipelago (Figure 6.1), the large island of Mindanao lies to its south, and the economic boom town of Cebu lies to the northwest. Bohol consists of one main island and 72 smaller islets and covers an area of approximately 5,000 sq km; it is the tenth largest island in the Philippines. The province is comprised of 1 city (Tagbilaran City), 47 municipalities and 1,109 barangays. Tagbilaran City is the commercial capital of Bohol, although the northern municipalities of Talibon and Ubay are also important commercial centres. Tagbilaran City and the municipalities immediately east of it are the most prosperous municipalities in the province, the poorest municipalities are the remote agricultural communities situated in the central and northern parts of the province, and some of the smaller islets to the north west of the main island (PPDO, 2000).

Bohol is a heterogenous landscape. The northern part of the island is comprised of gently undulating topography bordered to the east by mountain ranges. The southeast region consists of a narrow coastal valley bounded by an uplifted range of east to west trending mountains, while the southwest of the island consists of wider coastal valleys that adjoin a limestone plateau in the centre of the island.

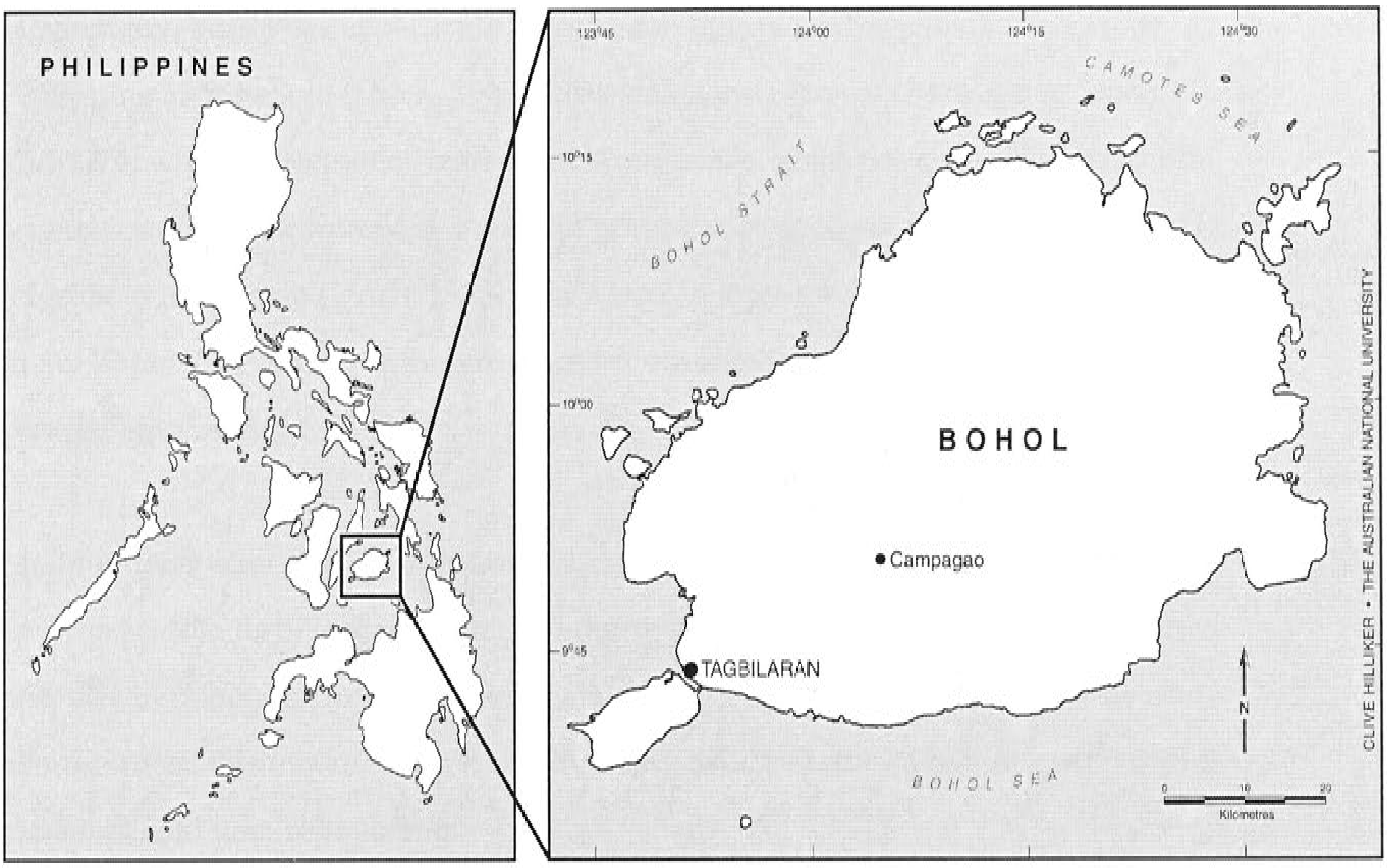


Figure 6.1: The Philippine archipelago, Bohol and Campagao

The Bohol economy is dominated by agriculture, with 60% of the workforce engaged in agricultural production. Approximately 45% of Bohol's land area is devoted to agriculture; however farm sizes are small, averaging only 0.6 hectares (PPDO, 2000). Rice is the most widely cultivated crop – almost 56% of the island's agricultural area is devoted to its production. However, rice yields vary considerably throughout the province, and they are, on average, lowest in the slightly alkaline soils of the uplifted limestone areas in the south and east of the province, and highest in the slightly acidic soils in the central and northern parts of the province (BAS, 2002). Corn is cultivated on 18% of the island's agricultural area – coconut, banana and root crop production is also widespread (PPDO, 2000).

While agriculture remains the largest employer in the province, its share of GDP, and government funding for agricultural development initiatives, continues to decline. The provincial government is looking towards other sectors to solve the economic crisis. Renowned for its famous Chocolate Hills, and growing in popularity as a prime tourist destination, Bohol is looking to develop its tourist potential, and its cottage industries.

Historically, Bohol has experienced one of the highest outmigration rates in the Philippine archipelago (Urich, 1989). This was particularly so between the early 1950s and 1974, when government resettlement programs, government funded irrigation schemes, and the discovery of a malaria prophylaxis encouraged many Boholanos to migrate to Mindanao (Urich, 1995). Immigration rates have now plateaued; however, many Boholanos still leave the province for other parts of the Philippines and overseas seeking employment.

Many tertiary educated Boholanos seek employment in the more affluent parts of Asia and the Middle East, in particular, and many periodically send money back to their relatives in Bohol; for some families, particularly those in remote agricultural communities, this income is an important source of cash for education, agricultural expenses, and loan repayments.

The above story paints a picture of a struggling province facing important economic, security and social problems. As the government struggles with these issues, ordinary farming families from remote agricultural communities, who comprise the majority of the Bohol population, use what social, human and economic capital they have to create and sustain a life for themselves and their families. Land fragmentation, declining yields and increases in the prices of already expensive inputs have had negative impacts on resource poor farming families. The following discussion introduces the rice farmers of Campagao and highlights the environmental, political, social and economic realities of life in an agricultural community in this struggling province.

6.2 Bilar

On a limestone plateau some 400 metres above, and 40 kilometres north of, Tagbilaran City, is the municipality of Bilar. Bilar is bounded to the south by the municipality of Loboc, which celebrated its 400-year anniversary in 2002, and to the north by the municipality of Batuan; the coastal municipality of Dimiao borders it to the east, with Sevilla to the west. Bilar covers an area of 101.30 sq km, is comprised of 19 barangays, and has a population of 17,035 people, which is expected to reach 19,246 by 2020 (PPDO, 2000). All of Bilar's barangays are small agricultural communities, aside from barangay Poblacion, which is the commercial and administrative centre of Bilar. Poblacion is home to the municipal church, the municipal hall, the weekend market, and several large trading stores which supply agricultural products, and general goods.

Bilar is wholly contained within the Loboc River Basin, and comprises 15.63% of that basin. It is bordered to the east by the Raja Sikatuna National Park (RSNP) which is the last remaining old growth Dipterocarp forest in Bohol (Urich, *et al* 2001), and to the west by the protected areas within the Loboc Watershed Reforestation Project (LWRP). These deeply dissected limestone formations dominate the landscape around Bilar. This karst terrain is highly permeable and comprised of a network of sinkholes and caves, which act to limit the overland flow of water, which occurs during intense rain events only.

With its dense forest, abundant water supply and intricate network of limestone caves, Bilar has been a favoured site of resistance for Boholano revolutionaries including national hero Francisco Dagohoy, who led a rebellion against the Spanish in 1774, and Miguel Valmoria, who made his final stand here against the Americans in the early 20th century. More recently, the mountains around barangay Dagahoy sheltered the NPA leader Commander Vargas (Apalisok, 1992). NPA resistance reached its height in the mid 1980s to mid 1990s, and consisted of ambushes and small scale confrontations between mobile NPA 'sparrow' cells and soldiers from the Philippine army; however, there was also some local anti-NPA militia activity, coordinated by the state and local landlords through Civilian Armed Forces Geographical Units (CAFGUs).

During the insurgency many farmers were forced to migrate from the more remote barangays, particularly Dagahoy, to barangays closer to the national highway such as Campagao. The barangay of Riverside, just a short distance north east of Poblacion, is now home to a contingent of soldiers from the Philippine Army, who use Bilar as a base in between pursuing remaining NPA cells in the neighbouring municipalities of Valencia, Sevilla and Balilihan.

Bilar has total land area of 13, 581 hectares, almost 30% of which is steeply sloping land. This land is concentrated in the barangays that border the RSNP to the east and the LWRP to the west. The majority of the land suitable for rice production is located in the lowland valleys running through the centre of Bilar. According to the Bilar Local Government Unit (BLGU), Bilar's agricultural production area totalled 3,684 hectares (BLGU, 2002); the vast majority of this land is planted to rice and maize, however root crops such as sweet potato or camote (*Ipomoea batatas*) are also economically important, as Table 6.1 suggests.

Table 6.1: 5 major agricultural crops – Bilar (BLGU, 2002)

Crop	Hectares	% of total Ag land area
Maize	1788	48.5
Rice	1095 (899 irrigated)	29.7
Coconut	250	6.8
Banana	185	5.0
Camote	140	3.8

Other land classifications include forest (6,221 ha), all of which is protected and managed by the Department of Environment and Natural Resources (DENR), and the RSNP and LWRP Protected Area Management Boards (PAMBS), and open grassland areas (3,683 ha), which are classified as agricultural protection zones and reserved for future agricultural expansion (BLGU, 2002). While the aforementioned forested areas may be protected from illegal activities by various municipal laws and national presidential decrees, the PAMBS and the Municipality (BLGU, 2002) recognise that legal protection has done little to stop the illegal cutting of trees, the burning of swidden land, or the gathering of firewood and raw materials.

Conflict over land use in the southwest region of Bohol has been quite common throughout the years and it is associated primarily with the restriction of farmers' rights over forest land (Urich *et al* 2001). The restriction of these rights has led to significant tension in Bilar, between the authorities charged with protecting the landscape, and those who reside near the RSNP, or who rely on its resources for their livelihoods. While, as far as I am aware, this tension has not resulted in any physical violence in Bilar, the tension between farmers and those charged with managing protected landscapes came to a head in 1999 when a NPA 'sparrow' unit assassinated 10 soldiers in the Chocolate Hills area near the neighbouring municipality of Batuan. This occurred two years after the Chocolate Hills was declared a protected area (Urich *et al*, 2001).

6.3 In Campagao

Campagao is a small agricultural community of 257 families (total population 1216) situated approximately 5 kilometres from the municipal town centre. Campagao is comprised of six puroks or sitio's (small administrative sub divisions): Maslog, Centre 1, Centre 2, Matin-ao uno, Matin-ao dos and Ilaud, which themselves contain between 25 and 55 households. Campagao is bounded to the east by the national highway and the barangay of Cansumbol, to the west by the hilly forest zones of the LWRP, and to the south and north by the barangays of Zamora and Cabacnitan, respectively.

6.3.1 Environment

Campagao is dominated by irrigated and rain fed lowland rice valleys interspersed between small conical shaped hills called mogotes (Urich 1995). These residual limestone formations are concentrated in the northern and central part of the barangay. To the west, these give way to a forested zone that contains more deeply dissected, higher limestone ranges which form very steep sided valleys. This topography has the effect of compartmentalising the barangay into distinct rice-growing areas.

Lowland rice paddies account for approximately one-third of Campagao's 432-hectare land area. The largest agglomerations of contiguous rice paddies are located along the national highway in the north of the barangay, near purok Matin-ao uno, adjacent to the barangay road near purok Matin-ao dos (plate 6.1), in the southeast of the barangay near the border with Zamora in purok Maslog, and in the east of the barangay around purok Centres 1 and 2. The remote purok Ilaud is comprised largely of grassland and hilly forest zones interspersed with relatively small and narrow rice valleys, often surrounded by steep sided limestone hills (plate 6.2).

Plate 6.1: Overlooking the contiguous lowland rice paddies of Mateno dos, Campagao

Plate 6.2: The karst topography around Ilaud, Campagao

Water resources are spread relatively evenly throughout the barangay; however, the larger contiguous rice valleys discussed above – the majority of which have extensive man-made spring or creek fed irrigation networks – have the most reliable water supplies. The barangay is criss-crossed by several creeks, the headwaters of which are located in the RSNP to the east of barangay Cansumbol. Some of these creeks are fed by permanent natural springs, referred to locally as tubud. The residents of Campagao recognise two types of tubud: sapa ang tubig, or gravity fed springs, and bugwak, or upwelling springs. The Tinugdan spring in purok Maslog is the barangay's primary gravity spread spring; this spring travels a great distance from the RSNP and discharges into a circular man made pool.

Several upwelling springs are located in purok Ilaud, and these are generally used for the purposes of water collection by neighbouring households; for some of the more remote residents of purok Ilaud, these upwelling springs are the sole source of drinking water. The primary hydrological feature of the barangay, however, is the Bilar River, a tributary of the Loboc River, which runs through the western edge of the barangay on its way north. The headwaters of the Bilar River are located in the hilly forest zones to the east in the municipality of Valencia.

The climate in Campagao is characterised by a prolonged period of average to above-average rainfall from June through to February, and a period of relative dryness in March through to May. Within the June to February period, rainfall does vary considerably, and this period is often characterised by intense rain and wind events in August and September. Despite its relative protection in the interior of Bohol, Campagao has experienced significant damage from three major storm events in the last 40 years: tropical cyclone Ruping in 1989, tropical cyclone Uitang in 1984, and tropical cyclone Reming in 1968. The impact of even moderate rain events is variable across the barangay and those paddies and houses located adjacent to some of the larger creeks that run through purok Matin-ao dos, and purok Centre 2 are particularly prone to flooding, something I witnessed on more than one occasion during my field work in 2002. Those farmers whose houses and paddies are located in the narrower valleys of purok Ilaud can also suffer from even moderate rain events. The wider, contiguous, and well draining rice paddies in purok Matin-ao uno only flood during extreme rain events.

6.3.2 The 'Machinery' of local politics

In Campagao, as with all barangays in the Philippines, local level governance is embodied in the barangay council. This council is comprised of the barangay captain, seven kagawad, or councillors, a barangay secretary, barangay treasurer and youth representative. These individuals decide how to spend the barangay's Internal

Revenue Allotment (IRA), as well as managing the Barangay Health Service (BHS), Barangay Tanod (police), and the Barangay Lupon, or local magistracy. The kagawad also represent each of the six puroks as well as chairing local committees such as the health committee and the agriculture committee. The barangay captain is also a member of the Municipal Development Council (MDC), which discusses revenue allotment and development opportunities for the municipality's 19 barangays.

The incumbent barangay captain is Boy Toledo. Boy has been the barangay captain since 1996. Boy is a political and commercial entrepreneur. Aside from being the barangay captain, Boy is one of the barangay's largest landowners and a moneylender; he also owns a transportation business, his family owns the local rice mill, and he is married to the daughter of the barangay's largest moneylender, to whom it seems the majority of the barangay is indebted. Boy's father Jose, who now runs the rice mill, was the barangay captain in the 1980s and was also a prominent municipal politician. All these factors provide Boy with the necessary 'machinery' to preside over the barangay.

'Machinery' is a term used by local farmers that describes a person's ability to facilitate things, for personal or community benefit. I first heard this term when interviewing a farmer who has, in the past, been actively engaged in local politics, but who has now taken a back seat. The excerpt below documents my first encounter with the term:

Anon: Yes, as of now he (referring to Boy) is powerful in this barangay
David: And has he done a lot…
Anon: I did not give favour to him because he is powerful, rich, but he is good to us.
David: What, so you're on his party because you think he's a good man?
Anon: Yes
David: And he's done important things.
Anon: Yes, but he has the wheels, the money, he can ah, I think it is easier for him because, he has the machinery.
David: He has a?
Anon: Owns the machinery for
David: Machinery?
Anon: The barangay that is a term for us, machinery
David: Machinery?
Anon: Machinery
David: What do you mean by that?
Anon: That means all the things he wanted is easy for him, accessible to all, people he can…for example, if this organisation want to, we will seek assistance from him, he

said what do you want, if we want some money he can give right away, aside from the money he has the barangay tanod, the barangay health workers, supporting him.

As the excerpt above demonstrates the term describes the power to facilitate things, through the possession of social, political, physical and economic capital. The requirement for personal wealth is also reinforced by the following quote:

David: Yeh, I've just heard farmers use this term.....called....... he has the machinery, it's like a metaphor for something. What does that mean?
Anon: Money, then...money...money, number one is money, if you have money, you've got that machinery, penetrate to the people.
David: Ah, so does everybody use this term machinery, is it a common?
Anon: Machinery is in the high level, it's political in nature.

6.3.3 'Overpolitics' and the 2002 barangay elections

While Boy no doubt wields significant power in the village, another politician challenged his tenure as barangay captain during the July 2002 barangay elections. Felix Bucar is a young, poor, relatively well-educated man, who, after living for some time in Manila, came back to Campagao and served one term as a kagawad. He decided to challenge Boy in the July 2002 elections. He and his party members told me they were disenchanted with the hereditary nature of local politics – something they believed was a hangover from the Spaniards – they were also disenchanted by the combative, bipartisan nature of politicking in the barangay, something Felix calls 'overpolitics'. Both concerns are expressed in the following discussion.

Felix: This coming election I was forced to run because of that kind of system, I want to transform it to be a good, honest...
Anon: Its just like Spaniards' time, when you're a....when your grandfather is the government so the rest of the family would follow, that's the trend of our politics, so the grandfather to the son and to the rest of the family to the great, great grandchildren, so each should be the governor, the head of that place.
David: So there's an inherited sort of governance, so the... has Mr Toledo's father, has he been involved in politics for a long time as well, was Mr Toledo's father the barangay captain?
Anon: The barangay captain.

Felix: Our government, the Philippine government is campaigning for non partisan politics in the barangay, because the barangay member.....the barangay council is the bridge from the people to the government, so the Philippine government is campaigning for non partisan so that's why I'm running for barangay captain because

.....because this a trend.......... I will transform it. Its very hard for me to transform if I'm lose, if I'm the loser, but I'm winning...
David: When you say that the Philippine government is attempting to implement non partisan politics at the local level...at the barangay level, how are they doing that, is this the national government, GMA's government?
Felix: No it's a very, very long time, every government.
David: Every government has tried to do that one.
Felix: Yes, but here no success, because of that overpolitics.
David: Over?
Felix: Over

Overpolitics reached a crescendo in the July 2002 elections, when apart from the battle between Felix and Boy, some 25 other townspeople ran for election as one of the seven barangay kagawads. Inspired by an honorarium of 1486 pesos per month, these prospective councillors used what little 'machinery' they had to get themselves elected. This included relying upon vast kinship networks for votes, as well as influencing others by more unlawful, but nonetheless mainstream means such as offering bribes. In the days before the election it was not uncommon to see poorer farmers offering what they could to secure a vote, ranging from pesos to pens, even handkerchiefs. The need to pay a cash bribe to secure a vote, however, was described economically by one prospective kagawad, who when asked why he didn't win in the election replied 'you can't win if you are a good person and give nothing, xxxxx is a good person who gave money....so he won'.

The giving of money or favours to secure a vote is an illegal but standard practice in Philippine politics, as anyone who has lived there could attest. It occurs at all levels of politics and it occurs in overt and not so overt ways. In the barangay, it simply involves surveying prospective households, and asking them whom they intend to vote for; if the answer is non-committal then one simply hands over what one can to secure a vote. This process exploits the Filipino value of *utang na loob,* which is a feeling wherein one is compelled to reciprocate something offered – regardless of its illegality. The following conversation with an anonymous prospective kagawad describes this value:

David: That's interesting because say you were given 50 pesos, you could accept that but then still vote for.........like you could say, thanks but I'm not going to vote for you. Like how does the person who gives the 50 pesos know that the receiver of that

money is actually going to vote for them? They could just take the money and vote for you guys.
Anon: But here in the Philippines we have a value of they call it, *utang na loob*, so its.... were too emotional, when someone give you that kind of money and then you're not going to vote for that person its.... it gives us conscience – O my god he didn't win and I accept that money, so there is a tendency that when you give money to that person that person should vote for you, because of that behaviour.
David: So you feel that there has to be some reciprocity, so in some respects you're saying that the people who buy votes are exploiting the *utang na loob* system?
Anon: Yeah.
David: Because they know that people feel like – O he gave me money so I have to vote.
Anon: I smell their money and then I didn't vote them so it's....... you know it's a big conscience for the people.

The exploitation of this cultural value allows those with the requisite 'machinery' to calculate exactly how much money they require to win an election and subsequently avail themselves of the 1486 peso honorarium, as the following quotation demonstrates:

Anon: It will, it is just like a gamble, gambling, like a three years.
David: Oh, so you're in for three years.... so if you spend 4 or 5000 in vote buying you can get........for three years you can get 1486?
Anon: Yes
David: So you can get, over 3 years that's not too bad
Anon: Only 5 months we can recover the 5000
David: Ah
Anon: In one month, the honorarium is 1400 plus, then for 5 five months if you spend 5000, you can recover.
David: Then you have two and a half years, free, of getting?
Anon: Yes.

However, it is not only money that influences voters. For example, some people voted for Boy because, as I have mentioned, they thought he could better serve the barangay and its residents, because of his wealth and connections, i.e. his machinery. This also extends to his ownership of physical machinery, such as trucks, which he lends to barangay residents for trips to the beach, or for other purposes. Those who are in vulnerable situations also tend to vote for the person with the most 'machinery' as they may subsequently rely on this person in a time of need, particularly if that person is, for example, an important moneylender. And people are also influenced by offers to work within the barangay council, the Barangay Health Service, or the Barangay Tanod. Needless to say, Boy successfully retained his office as barangay captain.

In chapter 5 I discussed the way in which resource poor farmers are systematically marginalised within the Philippine polity. The foregoing discussion described how this occurs at the local level. While farmers do have representation in the barangay government, the real power is open only to those who possess the requisite 'machinery' of power. The personalisation of power essentially precludes those without the 'machinery' from assuming power; this obviously precludes resource poor farmers.

6.3.4 Associational life in Campagao

Field Journal entry 30/9/02

Hermina lives in a small nipa hut on the boundary of Leonardo Dane's land. She moved there 16 years ago during the insurgency in Dagahoy, and has stayed. Her husband has passed away, her daughter is married but her son lives with her and works as a labourer. She has a very small rice paddy (1/8th hectare) that she cultivates; she also grows some taro and camote around the place. Joey and I interviewed Hermina today, she told us she has not harvested her small rice paddy yet, and unfortunately she has not been able to work as a labourer due to her illness – she was coughing quite heavily while we were talking to her. She told us that she attended the Purok meeting last night where she got 850 pesos from the abunoaey, she was the lowest bidder. She intends to buy some rice and fish with that money, and maybe pay some debts off.

In Campagao, as in many parts of the world where people lack economic resources, people tend to rely a lot on each other for survival. Sometimes, as the above journal entry describes, this help arrives just at the right moment; however, while such things may seem serendipitous, they should not be thought of as such, because they are, in fact the well tuned social adaptations of resource poor people – forms of social capital developed over time to help people like Hermina cope with the vagaries of life as a farmer in the Philippines. As we will see, it is associational life in its various forms that provides security, potential for savings and profit, opportunities, and avenues for learning within the barangay.

Associational life in Campagao is a vibrant mixture of the old and the new, with centuries-old indigenous social institutions existing alongside a growing number of incipient religious groups, and NGO and government-sponsored organisations (Table 6.2 presents a glossary of Campagao's social institutions).

Table 6.2: Social institutions of Campagao (Source: Author's fieldwork, 2002)

Indigenous Social Institutions	
Dayong	A burial association that provides the family of a deceased person with both money and a quantity of unmilled rice upon the death of a family member. It also takes care of all the activities associated with a person's burial, including transportation of the body, burial and coffin making, as well as food preparation during the wake and subsequent vigils. Membership is usually inherited from one's parents, although membership is open to all. Each household in a *Dayong* must compulsorily contribute a certain volume of rice and money upon the death of a *Dayong* member. There are 6 such associations in Campagao, ranging in size from 15 to 80 households. Every resident of Campagao is a member of a *Dayong*. May also be used as a credit and savings association.
Gala	A wedding association that provides the family of the groom with a significant sum of both money and rice upon marriage. Usually consists of up to 15 households. Typical contributions are 500 pesos and one *ganta* of rice per household per wedding. One's obligations expire once all fellow *gala* members' sons are married.
Minag soon	A wedding and burial association that is usually linked to membership of, or association with, a certain *kawitan* or religious group.
Hungos	A reciprocal labour exchange association wherein groups of 5– 6 farmers undertake to work on each others rice farms on a rotational basis.
Ajon-Ajon	A reciprocal labour exchange agreement between two persons.
Ripa	A rotating savings association wherein one contributes a fixed sum over a fixed period for the right to enter a regularly held lottery. Usually associated with an organisation such as a purok, or farmers' association, and can be used to raise money for that organisation.
Abunoaey	A rotating savings association wherein one contributes a fixed sum over a fixed term and receives a sizeable amount once during the fixed period. Members with pressing financial requirements may 'bid' for this money by accepting to receive less 'lowest bidding' than the total sum of their contribution. The differential may then be used to raise money for the group or it may be shared out to group members equally. Usually associated with an organisation such as a purok, or farmers association. Another, less common credit variant exists - 'highest bidding' refers to a situation wherein one agrees to pay back more than one actually borrows, this may also involve monthly interest payments. Again this is usually a means to raise money for a purok, or other organisation.
Ihaw-Ihaw	A profit-centred association wherein group members collect money to purchase a pig or carabao, which is then slaughtered and sold for profit. Typically each member will receive their *verada* or share of the slaughtered animal, which they may decide to consume or sell. The profit usually comes from the sale of the internal organs of the animal. Depending on the purpose of the *ihaw-ihaw* this profit may be distributed equally or used to build up communal funds to rebuild a purok hall or repair a canal.
Kanaway	An irrigation association that works communally to maintain canals. Members of a *kanaway* typically use *ihaw-ihaw* to raise money for canal materials.

Religious Organisations	
Cluster	A grouping or *cluster* of households practicing the Roman Catholic faith, who meet weekly to discuss teachings from the bible. There are 11 such clusters in Campagao; each cluster consists of between 10 and 12 households, and each has an elected president and treasurer.
Couples for Christ	An organisation, wherein groups of 5 – 6 Roman Catholic couples meet fortnightly to discuss teachings from the bible.
Government-related organisations	
Purok	The purok is a neighbourhood association consisting of all the households in a particular *sitio.* There are 6 puroks in Campagao, and they range in size from 25 to 55 households. The organisational structure of a purok includes a chairperson, vice chairperson, secretary, treasurer, auditor, press relations officer and sergeant-at-arms. Puroks meet once a month to discuss barangay-related activities, raise money through *abunoaey* or *ihaw-ihaw*, or to undertake *civac* or community work. The purok also monitors the health and economic well being of its members.
Farmers' Cooperative	A government-sponsored farmers' cooperative that consists of 25 farmers that were previously members of the *samahang ngayon* (a farmers' cooperative established during the Marcos era). Provides loans for members and raises money through *ihaw-ihaw*.
NGO-related organisations	
CFPRA	The Campagao Farmers Production and Research Association (CFPRA) is the barangays only farmers association (FA). CFPRA is a government-registered FA that works in partnership with the Southeast Asian Regional Institute for Community Empowerment (SEARICE) to promote more sustainable forms of agricultural production in Campagao. CFPRA currently has 26 active members.
Alab	*Alab* is the Bilar chapter of a human rights organisation associated with the KMP; this group's role is to monitor the region's human rights situation. According to the Campagao organiser there are 65 members of this group in Campagao and 500 in Bilar.

6.3.4.1 Campagao's Indigenous Social Institutions

According to Urich and Edgecombe (1999), Bohol's indigenous social institutions play an important development role at the barangay level. In a social environment characterised by strong bonding social capital, and an institutional environment characterised by a lack of formal savings, credit and insurance facilities, Boholanos have developed a series of unique institutions that are highly diverse, flexible and multifunctional, guided by strong sanctions and behavioural controls.

For example, the Dayong is a burial association found only in Bohol. The dayong takes care of all the activities associated with burial, as well as providing the family of the deceased with a small sum of money and a store of rice. The six dayongs in Campagao all have different rules, or – as the Boholanos call them – Standard Operating

Procedures (SOPs). SOPs refer to an individual's contribution of money and rice upon the death of another dayong member, and the expectations associated with group membership. Some dayongs specify payment upon death; others require it beforehand, in order to establish a stock of money and rice, which can then be used for saving and credit purposes. All members contribute an equal amount and larger dayongs typically have smaller contributions (e.g. 10 pesos and two gantas of unmilled rice) (a ganta is a measure of rice weighing approximately 1.5 kilograms; there are 25 gantas to a cavan), compared with some of the smaller dayongs (e.g. 50 pesos and four gantas of unmilled rice).

Obviously, larger dayongs are also characterised by more extensive social obligations, for example Julio Dapar's dayong is comprised of 80 households (approximately 1/3rd of the population of Campagao); membership in such an extensive dayong involves constantly providing small amounts of money and rice, as well as attending many funerals and vigils; and is repaid by a large sum of money and volume of rice (800 pesos, 160 gantas of unmilled rice) upon the death of a family member.

While the SOPs may vary between dayongs, the sanctions imposed on members who shirk their dayong obligations are very similar. Fines of up to 100 pesos (one day's labour) are imposed on a household which fails to attend the house of a deceased person within a set time, without a suitable excuse; and these fines are often used to build up the communal fund. And while membership is open to all, new members are subjected to what could loosely be described as a character check, and those who consistently avoid their dayong obligations through failing to attend the house of a deceased person, or failing to pay back the interest on a dayong loan, may be expelled from the dayong.

The social obligations that come with membership of a large dayong – particularly the time involved in travelling – sometimes leads to the formation of a new dayong, often by migrants to the village, or people who have moved to another purok. For example, Palab's dayong, established in 1998, is the only incipient dayong in 50 years, and was established by a group of recent migrants from barangay Dagahoy, who all live near each other, on and around the Dagahoy road in Matin-ao dos. This group has formulated its own SOPs based on the expectations of its members.

The flexibility and multifunctionality of each dayong relies a lot on the dayong leader, as it is the leader who is responsible for the collection and determination of SOPs, the establishment and maintenance of any communal fund of rice and money, and the development of savings and/or credit schemes. Some dayongs are significantly more advanced in this respect than others, and it seems the difference lies in the management skills and foresight of the dayong leader. For example, Loloy Lamanilao inherited his dayong leadership from his father, he then set about moving away from large rice contributions towards set dayong shares of 300 pesos per family. He used this money to set up ihaw-ihaw fund raising schemes, the profits of which are equally distributed to dayong members; Loloy's dayong also provides credit to members at very low interest rates.

Another example of the diversity and multifunctionality of Campagao's indigenous social institutions is the abunoaey and ihaw-ihaw savings and profit associations. In the past these institutions were comprised of neighbours and relatives who contributed rice at the end of every harvest (abunoaey), or slaughtered a pig or carabao for an important social occasion (ihaw-ihaw), particularly the local town or barangay fiesta. These days the abunoaey is used to raise large amounts of money for immediate needs, such as agricultural inputs or the repayment of debts, and the bidding systems discussed in Table 6.2 provide an avenue through which those with pressing financial concerns can access this money ahead of time, at the same time as contributing to the communal fund. The abunoaey now no longer exists as a separate institution, as it has now been appropriated by the puroks, and other organisations.

Ihaw-ihaw is probably the most popular money raising institution in Campagao; everyone I spoke with in Campagao had participated in an ihaw-ihaw at some stage. It is particularly important just before the fiesta when all of Campagao's households open their doors to their fellow barangay residents to commemorate their patron saint Isidore. The ihaw-ihaw is another old institution that has been appropriated by more recent institutions. Previously the ihaw-ihaw was used to provide farmers with meat to consume during the fiesta and other social occasions; now it is used primarily for capital build up or personal profit. The puroks, some kanaways, and the farmers' cooperative all use ihaw-ihaw for these purposes.

In contrast to the institutions mentioned above, the barangay's indigenous reciprocal labour exchange associations (ajon-ajon and hungos-hungos) are declining in both popularity and membership. This is influenced somewhat by the increase in availability of cheap, negotiable labour, and a growing preference for cash paid labour amongst farmers who also work as labourers. For example, in 2002, of the 51 farming families I interviewed, none participated in a hungos-hungos, and 15 participated in ajon-ajon. The ajon-ajon was used for transplanting and/or pulling rice seedlings only, and was often used by those faced with a shortage of cash to pay labourers; as such it was more prevalent amongst those farmers with little cash incomes, and those with large families, and thus large reservoirs of available labour. I will discuss the decline in reciprocal labour exchange, the continuing importance of ajon-ajon, and the decline of hungos-hungos, in greater detail in chapters 7 and 9.

Unlike the hungos-hungos, the kanaway remains a popular communal labour association, particularly amongst those farmers whose canals are not concrete lined. These stone or clay canals require constant maintenance throughout the year, and it seems that the level of cooperation, the scale of sanctions, and the extent of the kanaway's internal organisation, such as whether it has initiatives to build up capital, are in direct relationship to the condition of the canals which it maintains.

6.3.4.2 Religious organisations

Barangay life is permeated by religion. Campagao has three barangay chapels and Sunday Mass in the Municipal Church is the major weekly religious and social event. The vast majority of Campagao's residents are Roman Catholic, and at least half of the barangay's households are members of barangay bible study groups or Clusters. The Cluster system is a contemporary initiative of the Roman Catholic Church that promotes bible study among barangay residents. Each practicing Roman Catholic household in the barangay is expected to send a representative to Cluster meetings every Saturday. Each Cluster is presided over by a Cluster leader – usually a senior community member – who represents that Cluster at barangay chapel meetings. Aside from encouraging bible study, the Cluster also promotes worship, religious education, religious family life and religious service, as well as being an avenue through which funds for the Church can be collected. The Cluster leader also approves clearances for people who wish to be married, have a child baptised, or have a relative buried; these clearances are granted providing one has been an active member of the Cluster, and this encourages at least one representative from each household to attend Cluster meetings.

Two other organisations that have widespread membership are the Couples for Christ (CFC), and Singles for Christ (SFC) groups, which also promote bible study and religious education. The barangay also has a growing number of non Catholic religious denominations including Jehovah's Witnesses and a local, well attended evangelical church called Jesus Christ for the Nation (JCN), which has its own dayong, gala and capital building initiatives.

6.3.4.3 The purok

The purok is a neighbourhood association that raises funds for personal and communal benefit (through ihaw-ihaw, abunoaey and ripa), keeps records of the economic and health characteristics of households, and provides an avenue through which the barangay council's development proposals and projects can be discussed. The purok is a relatively new institution, developed in the 1990s by the Philippine National Government to promote community development at the barangay level. Participation in purok life is enforced by fining those who fail to participate in the activities of the purok, or by other sanctions, such as the non-approval of clearance forms that might be required to work in another region. By and large the majority of households in Campagao are active members of their respective puroks, and purok meetings are often lively, convivial affairs.

6.3.4.4 Farmers' Organisations

The Campagao Farmers Production and Research Association (CFPRA) is the barangay's registered farmers association. CFPRA is comprised of 26 active members, and works with an NGO – the South East Asian Regional Initiative for Community Empowerment (SEARICE) – to promote sustainable agriculture, organic rice farming, and the preservation of rice plant genetic diversity. CFPRA was formed in 1996 after SEARICE carried out a season long Ecological Pest Management (EPM) workshop in Campagao. The core of the group had previously been formed during a government-sponsored Integrated Pest Management (IPM) workshop the year before.

As with most institutions in Campagao, CFPRA has various capital building schemes, including the ripa and abunoaey. However, CFPRA is, first and foremost, a knowledge generating and sharing forum, through which members discuss the issues that are relevant to farmers with an interest in more sustainable forms of agricultural production.

The other farmers' association in Campagao is the Campagao Farmers Cooperative (COOP). The COOP is comprised of 25 members, most of whom were previously members of the samahang ngayon, from the days of President Marcos. Despite the long history of the COOP, and its potential to provide services to resource poor farmers, it has failed to attract any new members in a long time. This is primarily due to the high cost of a share in the COOP, and the fact that the farmer members are relatively affluent compared to Campagao's resource poor farmers.

6.3.5 *Economic Life*

Farming is the mainstay of the Campagao community. The vast majority of Campagao's residents are involved in agricultural production as either farmers, labourers, or in many cases, both. Rice farming remains the most important form of income and employment for farmers and landless labourers alike. Due to the social and cultural importance of rice, the vast majority of farmers prefer to have an adequate store of rice instead of selling it for a short-term profit. In Campagao, a successful rice farmer is one who can grow enough rice to feed his/her family for one season, as well as paying back the debts accrued during the season, while very successful rice farmers are those that can achieve the former, as well as selling rice for profit. In order to get adequate income to pay for life's necessities, e.g. purchasing other foods, paying for one's numerous social obligations (abunoaey, ripa, ihaw-ihaw), and educating children, Campagao's farmers and their families rely upon a diverse array of income strategies.

6.3.5.1 Other agricultural activities

Aside from the production of rice, the majority of farmers are engaged in at least one other form of agricultural production. Corn production is the second most dominant form of production in Campagao, and takes place in the rain fed areas of the barangay that are unable to sustain a rice crop; corn is sometimes also preferred by farmers who cannot afford the inputs required for rice production, regardless of water supply. Corn production is, however, quite limited in Campagao compared to some of the more remote barangays of Bilar that are unsuited to rice production because of the prevalence of hilly terrain and intermittent water supplies.

The production of copra from coconut is also an important income stream, which provides farmers with two or three cash payments throughout the year, which may vary significantly depending on the copra market. The selling of bananas and other fruits is also an important income stream, although not as widespread as copra production. One of the most popular and growing streams of income is vegetable production, particularly the production of chillies, which are sold in the nearby province of Cebu. The production of other high quality, low volume vegetables such as bitter gourd and bok choy (which are mostly grown for commercial purposes) is also widespread, as is the production of camote, cassava, and taro which are used more as local subsistence foods. The production of tuba – a fermented alcoholic drink made from the sap of the coconut flower – is another important source of income for a minority of farmers.

Animal husbandry is an important form of income for some of the more affluent farmers with expendable incomes. Piglets are raised for personal consumption during the fiesta, or sold to purok groups or others using the ihaw-ihaw system. The raising of chickens for personal consumption, and for profit, is also widespread, and because of its low initial cost is much more prevalent amongst the poorer households than pig production.

6.3.5.2 Labouring

In Campagao, there are very few farmers who do not undertake day labour of some sort to complement their other income sources. Those farmers who are fortunate enough to own a carabao (a water buffalo used for land preparation) may hire the combined labour at 200 pesos per day to plough (daro), harrow (sudlay) and level (kahig) rice paddies, however, this practice is declining due to the growing use of the mechanical hand tractor – as will be discussed in chapters 7 and 9.

Labourers are typically paid 100 pesos per day, or 80 pesos per day if food and snacks are provided. Day labour can consist of any of the tasks involved in rice production including making dykes (timbaw), brushing and cleaning the dykes (hagbas), preparing the seedbed (lempi tadan), pulling and transplanting rice seedlings (pagtanum), or weeding the rice paddies (pagcamote). The harvesting of rice paddies in Campagao is carried out using the pito-pito system, wherein groups of harvesters are paid one seventh of the gross harvest. This is a very important source of rice for landless labourers, and a source of extra income and rice for farmers with limited rice land and income streams.

Recently a system of bidding has been introduced, wherein a group of pito-pito harvesters will undertake to weed a farmer's rice paddy in exchange for the right to subsequently harvest that field. In other parts of Bohol (see Urich, 1995), the bidding practice extends to other aspects of rice production; however, in Campagao it is limited to weeding. The practice of bidding has arisen because of increased competition between harvesters. In some areas of Bilar (including Campagao) a system called pakyao (i.e. contracting for specific labour-intensive jobs) has also arisen; this is usually associated with timbaw and hagbas only and usually only used by larger landowners who hire workers en masse. However, the practice is spreading amongst more resource poor farmers.

6.3.5.3 Commercial enterprises

Small commercial enterprises can also be an important source of income for Campagao's farmers. For example, a small number of farmers supplement their incomes by selling general goods through sari-sari stores. These small stores are ubiquitous throughout the Philippines, and usually sell items such as beer, rum, coke, chips and cigarettes, at slightly marked up prices. Some of the more affluent farmers – who have access to a motorbike – may engage in hubble-hubble driving, wherein a small charge is paid for transporting goods or people, and those farmers with a carabao may also transport goods, such as sacks of fertiliser or bags of rice. It is usually the case that any farmer with even a small amount of expendable income will use that income to start a small business of some kind; during my field work, I witnessed everything from vegetable production to plastic bag and clothes selling, and fish and meat vending.

6.3.5.4 Remittances

One of the most important sources of income for a significant proportion of Campagao's residents is the remittances sent from relatives living either abroad or in other provinces of the Philippines. This is the case throughout the Philippines, where, as I have mentioned, the importance of remittance income continues to grow. The focus on remittances and the potential earning power of one's offspring has influenced farmers to invest all they can in the education of their children. Those farmers lucky enough to have relatives working overseas are by far the most economically secure farmers in the barangay. Remittance money is often used to finance agricultural production, pay for housing maintenance, and educate children to the tertiary level. Those with children working in other parts of the Philippines can usually expect to receive much smaller remittances until their offspring starts a family of their own. It is also often the case that an older family member, sometimes the head of the household, will travel to another province to undertake short term work, while leaving the cultivation of the rice paddies to a close relative.

6.3.5.5 The local credit market

In order to appreciate the economic opportunities open to Campagao's residents (as both suppliers of credit and customers) it is necessary to have some understanding of the local credit market. Despite the lack of any formal credit facilities in Campagao, credit is very easy to come by in the barangay. There are numerous types of credit arrangements pertaining to agricultural production in particular. One of the most popular forms of credit is that offered by the local store (Rapatan's Store), who will supply farmers with one bag of inorganic 'complete' fertiliser (cost PhP 430) at the beginning of the rice season in exchange for 60 kilograms of unmilled rice at the end of the season (value between PhP 510 and PhP 600). Credit can also be sought for the payment of labour associated with land preparation (or for any other agricultural task that requires payment upon completion) and this credit is usually supplied by larger landowners, or professionals, at a cost of PhP 6 per kilogram of rice supplied. For example, if a farmer wishes to borrow PhP 600 to pay for the hire of a hand tractor at the beginning of the season, then that farmer must supply the creditor with 100 kilograms of unmilled rice (value between PhP 850 and PhP 1000) at the end of the season.

Aside from the payment of unmilled rice for cash loans, cash can also be credited at a rate of 10% per month. This system is not normally used for agricultural purposes however. As mentioned, numerous local social institutions also provide credit arrangements and these are usually much more equitable than those arrangements provided by individual money lenders, however, it is usually the case that these services are overextended at the beginning of the cropping cycle, which forces farmers to use alternative, and relatively usurious credit arrangements.

The preceding discussion described a village not unlike many others in the 'developing' world. The history of conflict, the primacy of agricultural production at a subsistence level, the lack of economic opportunities, and the vibrant associational life, are characteristic of resource poor villages throughout the Philippines and the 'developing' world. The lack of democratic representation and the tension that exists between the patrimonial old guard and new forces for change are also common experiences throughout the 'developing' world. Another experience that is common to villages throughout Southeast Asia was the modernising influence of the green revolution, which in a short number of years largely usurped the traditional modes of production that had lasted for hundreds, if not thousand of years. This process, and the changes it wrought in Campagao, will be discussed in the next chapter.

7. From the kinaraan to the green revolution: the metamorphosis of a rice production system

Having reviewed the local institutional, socio-economic, and environmental conditions that influence rice farming in the barangay of Campagao, I will now move on to discuss the changes that have occurred in local rice farming practice over the last 30 years – a period which saw the metamorphosis of rice production in Campagao from a traditional, centuries-old system based on local knowledge (the kinaraan), to a highly technical, socially ahistorical and epistemologically exclusive system of production – namely the green revolution.

As chapter 5 argued, the aim of the green revolution in the Philippines was the metamorphosis of low yielding, traditional, reproductive modes of rice production to high yielding, scientific, productive modes of rice production, as well as accompanying changes to the social structures, systems of exchange and perceptions that were thought to inhibit productivity. The following discussion will examine these changes as they occurred in the barangay of Campagao through the collective memory of the barangay's rice farmers; it will provide a descriptive representation of this metamorphosis – a more theoretical analysis of the implications of the data will be presented in chapters 10 and 11.

I will begin the chapter by introducing the agroecology of the traditional, or kinaraan, system of rice production, and the social structures and systems of exchange within which it must be contextualised. I will then discuss the historical metamorphosis of this system, and its replacement with the green revolution system. This will include a summary of the new agronomic practices that accompanied the green revolution in Campagao, as well as a discussion of how the farmers of Campagao responded to these new technologies. The relatively slow uptake of green revolution technologies within the barangay will also be discussed, as will the hybrid agronomic practices of Campagao's farmers. I will conclude with comments on the changes in labour patterns that accompanied the green revolution, and the limited impact of green revolution agrarian reform in the barangay.

7.1 The kinaraan system of rice production

The farmers of Campagao refer to their traditional system of rice production as kinaraan, which literally means 'traditional' or 'from the past'. While I will refer to the kinaraan as a system, I do not intend to use the term system as a boundary marker, because, as will become clear in my subsequent discussion of the hybrid methods adopted by Campagao's farmers, it is actually quite difficult to ascertain where one system ends and another begins. What I can do, however, is describe a mode of agricultural production that was dominant within a historical context which produced certain outcomes because of particular social arrangements.

The traditional rice farming system of central Bohol was first witnessed by the Spanish 400 years ago (Chirino, 1604), and was widespread in Campagao until the mid-to-late 1980s. For hundreds of years this system of wet rice production provided the staple diet for coastal and interior dwelling Boholanos. Urich (1995) suggests that this system of rice production was the backbone of a highly developed rice economy that provided Boholanos with the necessary resources to resist Spanish occupation throughout the Tamblot rebellion in the 17th century, and the longer Dagahoy rebellion (1744 -1825). Urich (1995) further suggests that the rice economy of Bohol's interior may have sustained a population of up to 300,000 people, and that the province was self sufficient in terms of rice production up until the green revolution (Urich, 2000).

The kinaraan was a system of wet rice production that consisted of the use of late maturing Traditional Varieties (TVs), fertilised with local nutrient sources, and accompanied by the use of repellent plants to deter pathogens. Under the kinaraan system, rice was harvested twice per year, firstly in September - October, at the end of the panuig season and secondly in March - April at the end of the panolilang season. The seasonal agricultural cycle is in presented in Table 7.1.

Table 7.1: Seasonal Rice Cropping Calendar- Campagao Kinaraan system (Source: Author's fieldwork, 2002)

Rice	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Panuig				S, LP	T	W			H	H		
Panolilang			H	H						S, LP	T	W

S, LP- Seedling and Land Preparation; T- Transplanting; W-Weeding; H- Harvesting.

7.1.1 Rice plant genetic material used during the kinaraan

The TVs used during the kinaraan period are most accurately defined as landraces. Landraces are morphologically similar but genetically heterogenous varieties (Harlan, 1975) that demonstrate variable adaptations to environmental stresses, and as such are not as genetically and morphologically uniform as modern cultivars. Landraces attain moderate yields, are tolerant to a range of abiotic and biotic stresses and demonstrate stable yield patterns (Zeven, 1998).

By far the most popular landraces used during the kinaraan period were the varieties lubang and kainte; for example, when asked to recall the names of some TVs, almost every farmer I interviewed (n=51) named lubang first and kainte second. The popularity of lubang and kainte was also observed by Bertuso (2000) in her study of red rices in Campagao. Red rices are those that have red pericarps; in Campagao, these rices are preferred by many farmers and labourers due to their palatability and hunger suppression qualities.

Lubang is a photo-period sensitive variety that was only planted during the panuig season; an aromatic variety, it was preferred due to its palatability, high yield relative to other landraces, and pest and disease resistance. It was typically planted in rotation with kainte, which could be planted in both the panuig and panolilang seasons. Kainte is a tall, pest resistant variety, less palatable than lubang, and less prone to lodging. While the lubang/kainte rotation was by far the most popular, many other landraces were commonly used during the kinaraan period; the varieties panganahaw and agusan were popular alternatives to kainte during the panolilang season, and many glutinous varieties – referred to locally at pilits – were also planted.

7.1.2 Varietal selection and varietal diffusion during the kinaraan period

During the kinaraan period, Campagao's rice farmers exploited the genetic heterogeneity of the locally available rice plant genetic material to produce landraces suitable to the poor soils and variable climate of the region. This local experimentation was a particular characteristic of the kinaraan, and an important part of local knowledge(s). As we will see, this experimental behaviour persisted throughout the green revolution and post-green revolution periods, and is now making significant contributions to increasing the agricultural biodiversity of the region, and the options open to local farmers.

The most common method of increasing local rice plant genetic diversity was through varietal selection. Three methods were employed by farmers to increase diversity and promote seed quality. The most popular method was positive mass selection, which is a process whereby a farmer identifies a section of the rice crop that possesses favourable characteristics, and harvests that area prior to the main harvest. The most frequently reported positive attribute was resistance to tungro disease. Tungro is the most important virus disease of rice in Asia and is caused by a complex of two viruses: Rice tungro bacilliform virus (RTBV), and Rice tungro spherical virus (RTSV), both of which are transmitted by five species of leafhopper (Cabunagan *et al*, 2001). Other traits such as resistance to lodging and the presence of long panicles were also favoured. Typically, farmers would select from the centre of the rice field as these areas suffered from the least disturbance.

In order to ensure seed quality, farmers would also undertake negative mass selection, which involved perusing the rice crop the day of the harvest and roguing out undesirable 'off types'. The farmers of Campagao use the term 'off type' to describe any single plant that has morphological or life cycle characteristics different from plants with the same parentage. Farmers using this method would select rice for the next year's planting from the bulk harvest. Non-uniform, tall off types were specifically targeted during negative mass selection. Farmers would also engage in positive off type selection, a process wherein individual panicles with desirable characteristics were selected and replicated in small trial plots. The positive traits earmarked during this process included heavy, full panicles, and short stature.

In relation to infraspecific diversity, apart from the widespread planting of glutinous varieties alongside the favoured red rice landraces, there is little evidence that the farmers of Campagao planted several different landraces at the same time; rather, they seemed to have relied upon the genetic heterogeneity of the favoured landraces to provide the necessary diversity in the face of abiotic and biotic stresses. According to the Campagao farmers, lubang and kainte were planted in a wide range of landscapes from the unfavourable lowland rainfed and drought prone areas, to the favourable lowland irrigated areas, in taloon, basbason and katungganon soils. It was typical for a farmer to have plots scattered across both favourable and unfavourable areas; as such, prudent farmers would develop strains of lubang and kainte (or get access to such strains) that were suited to their different paddy environments.

During the kinaraan period seed could be acquired in four ways. Firstly, seed could be saved from a previous harvest and reused; such seed was usually stored in a hollow bamboo trunk referred to as a sagob for periods of up to one year; however stored seed was rarely planted in three successive seasons due to diminishing yields. Secondly, seed could be purchased from a store or another farmer; this often occurred when a farmer experienced a low yield or had no other access to high quality seed. Thirdly, seed was exchanged with other farmers, a system referred to as balo-balo. A major concern of farmers engaging in balo-balo was ensuring the acquisition of high quality seed; this was achieved through the monitoring of neighbouring rice paddies. Farmers looked for uniform varieties that performed well in conditions similar to the conditions in their own rice paddies. The necessity to observe in order to assure seed quality meant that most balo-balo exchanges took place amongst neighbours. Fourthly, seed was also acquired through the pito-pito system, as discussed in chapter 6. The pito-pito system was, and remains, an ideal way to expand one's access to new planting material. Many farmers discussed the tactic of targeting a particular farmer's field for harvesting, to get access to a variety that looked promising.

7.1.3 The cycle of rice production during the kinaraan

During the kinaraan period, the rice-growing season traditionally began with the making of the paddy dykes (timbao), and the brushing and cleaning of the dyke walls (hagbas). Timbao and hagbas were usually undertaken by the cultivator of the field, and his family, or with the help of the ajon-ajon or hungos-hungos systems of labour exchange. Once the paddy dykes were prepared, the land would be cultivated via a four-step process with the aid of a carabao. This would include an initial ploughing of the paddy field (daro), a very time consuming process which could take up to 2 - 3 days per hectare – depending on soil type – and was made even more difficult by the deep root penetration of the traditional varieties. In some soils, particularly the deep katungganon soils, large clods of mud were produced from the ploughing process, making it necessary to 'roll' the paddy fields with a pigis, a large wooden roller used to break up clods of mud prior to harrowing. Depending on the soil type, 'rolling' would be followed by up to three harrowing passes (sudlay), and a final levelling of the paddy field (kahig). Levelling was considered a particularly important land preparation by some farmers, as it was also a method of controlling the mole cricket.

Once the paddy had been prepared, a raised seedbed was constructed and pre-germinated seed was broadcast on this seedbed and left for three to four weeks, or until the seedlings had reached a height of approximately 9 -10 inches. These seedlings were then pulled and directly transplanted (pagtanum) into the rice paddy. The landraces used during the kinaraan period were planted randomly, at approximately 30 -35cm spacings, at 5 to 7 seedlings per hill. The planting rate was high to compensate for the low tillering capacity of the varieties used.

The seedlings were fertilised using the tuslo method, which refers to a process wherein the roots of recently pulled rice seedlings were dipped into a mixture of bat guano, water and carabao wallow (guano sa buho), immediately prior to transplanting. The farmers of Campagao also refer to this process as 'starting'. Many of the older farmers I spoke with talked of the importance of starting the rice seedlings correctly, and as we will see, the importance of starting persisted for years after the introduction of green revolution fertilisation techniques (e.g. basal application and top dressing).

The gathering of guano was a particularly laborious and dangerous occupation. For example, two major sources of guano, the Hugos-Hugos, and Na Ug-On caves are located in remote locations in the neighbouring barangays of Cansumbol and Dagahoy, respectively. Prior to transplanting, groups of farmers would accompany each other to gather guano; the amount gathered would depend upon the type of transport at one's disposal, and the size of one's rice paddies; those without carabaos would either carry large drums filled with guano themselves, or employ other farmers to gather and transport the guano for them. Gathering guano involved descending into dark, slippery, limestone caves, and was, according the some of the older farmers I interviewed, the least favoured job of the entire rice growing cycle – during my discussions I heard numerous stories of severe injuries and deaths occurring during guano gathering expeditions.

Aside from the dangers involved in its gathering, there is some evidence that access to guano had become quite restricted during the latter days of the kinaraan. Some of the farmers I spoke with commented that over time they noticed the guano levels decrease, and some mentioned that it was often the case that only a little guano was left for them after other farmers had collected their season's guano; this forced some farmers to gather guano in caves as far away as Subayon, a barangay quite a distance to the southeast of Campagao bordering the Raja Sikatuna National Park. There is also little evidence to assume that other renewable sources of nutrients were being utilised; for example, many of the older farmers I spoke with recalled burning the rice straw left after the harvest, every season, and there is no evidence that rice husk (tahop) was used as a fertiliser either. Interestingly, as we will see the use of rice straw became widespread during the green revolution.

The application of guano sa buho through the dipping process was also a laborious task – between 10 and 12 transplanters and five or six 'dippers' were required per hectare per day. The cultivator's family performed much of this labour; however, the ajon-ajon and hungos-hungos systems of labour exchange were also very important in this process. Interestingly, the vast majority of transplanters were females – men usually, but not exclusively, undertook the pulling, and children and the elderly usually helped with the dipping.

After a period of three to four weeks, the rice paddies were weeded (pagcamote) by the cultivator, and the cultivator continued to monitor the crop for pest and disease attack until harvest. A number of strategies were employed to control pathogens and most of these revolved around the use of repellent plants. For example, in the event of a tungro infestation, the branches of either the kanumay or tagbak tree were placed in a cross formation within the paddy boundary, while the leaves/branches of madre de cacao, sibocao, tagbak, bagakay and banti were used to repel insects such as rice bug and green grasshopper; rice straw ash was also broadcast as a defence against stem borer. According to some of the older residents of Campagao, the use of repellent plants was widespread throughout the barangay, and persisted to some extent even up to the introduction of MVs in the 1980s, as Nang Upe Dispo, one of the CFPRA farmers summed up "we used herbal plants; we place that in our field because of the superstitious beliefs of our old people".

Harvesting was undertaken using the pito-pito system, as outlined in chapter 6. If the harvest was poor, the usual 1:7 split would typically be reduced to 1:6 or 1:5 (or even 1:1) in order to attract a harvesting team. Rice panicles were dislodged using a garab, a curved knife used exclusively for this purpose, and rice was usually sun dried and foot threshed. Yields were calculated as cavans of dried unmilled rice (humay) per hectare. A cavan is a traditional form of measurement that is based on volume not weight. A cavan is comprised of 3 piligahans, 25 gantas, or 150 salmons. The weight of a cavan varies depending on the variety grown; for example a cavan of unmilled rice from a traditional red pericarp variety (e.g. lubang) could weigh up to 45 kilos, whereas a modern variety averages about 40 kilograms. According to Campagao's farmers, yields using the kinaraan system ranged from 25 to 50 cavans per hectare (i.e.1.12 - 2.25 t/ha). This range is corroborated by data from the Bureau of Agricultural Statistics, which shows that rice yields for all paddy environments, across 21 sites within Bohol averaged 1.34 t/ha in 1987 (BAS, 2002), at which time TVs were still widely planted in Bohol. According to the farmers I interviewed who had experience with the kinaraan system, the most limiting factor influencing rice yield was climate, most notably, high winds, flooding, and insufficient rainfall.

Prior to consuming the first rice of the season it was common for Campagao's farmers to offer rice to the engkanto, or spirits of nature who dwell in the caves, trees and springs. An offering would be made by placing cooked rice either in the front of one's house or in the centre of the rice paddy from where the rice was harvested. This ritual is called patilow. This practice was widespread in Campagao up until the 1990s, and persists amongst some farmers to this day. As will subsequently be discussed, the decline in popularity of this ritual has more to do with religious edicts prohibiting its practice than any sudden rationality instilled by modernisation or the green revolution. Patilow was a tradition passed down through time, wherein the health of the rice paddy and indeed one's own health was dependent upon making offerings to the engkanto. This belief was so strong that if one wanted to break with the patilow ritual (which happened increasingly throughout the 1970s and 1980s), a specific ritual designed to placate the engkanto was called for; this sometimes involved engaging a quack doctor to act on one's behalf. I will discuss this issue further in my discussion of local knowledge(s) during the green revolution.

7.1.4 Indigenous social institutions during the kinaraan period

During the kinaraan period, Campagao's indigenous social institutions served essentially the same purposes as they do today; they provided insurance in times of calamity, resources to fulfil vital social obligations (e.g. weddings and funerals), and access to the large pools of labour required for the task of rice production. However, over time there have been some significant changes. For example, the abunoaey, described in Table 6.1, was preceded by similar organisations variously referred to by some of Campagao's older residents as bijaay, bugasay, or abuno. While the purpose of these organisations was the same as their contemporary, i.e. to accumulate savings or to avail of credit, the commodity saved or credited throughout most of the kinaraan period was rice, not money as it is today. As we have seen the abunoaey is now considered an activity of the puroks, in the past the bijaay/bugasay/abuno usually consisted of a group of 10 to 20 neighbouring households, who would each contribute one cavan of rice at the end of each growing season. Every season the total number of contributed cavans would be available to individuals within the group on terms established within each group and, as with the abunoaey, it was possible to bid for a lower share in the case of an emergency.

Other indigenous social institutions such as the dayong, gala, and minag soon have retained essentially the same characteristics as they had in the past, except that, as with the abunoaey, money has largely replaced rice as the primary contribution. The gradual replacement of rice with money within Campagao's indigenous social institutions is indicative of the wider socio-economic changes that took place in the more remote regions of Bohol in the latter part of the twentieth century. Many of the older farmers I spoke with recalled that, prior to World War 2, money was a rare commodity. The needs of the household were provided by the household's rice farm, their swidden field (baow), the vegetable garden, and through animal husbandry, particularly the production of chickens and pigs. Those farmers without access to rice land worked as labourers and accessed rice through the pito-pito system, or were paid with rice for undertaking other labouring tasks; and while money was occasionally used to pay labourers, it was usually set aside for other purposes (e.g. education, purchases during the fiesta and weddings). Cash was usually acquired by selling pigs, chickens, vegetables or fruit; and fish, salt and other non-local supplies were obtained by trading rice, coconuts, or other farm commodities with coastal dwellers.

In the largely subsistence economy that existed during most of the kinaraan period, Campagao's indigenous labour exchange institutions (kanaway, hungos-hungos, and ajon-ajon) played a vitally important role. The vast majority of labour used in the kinaraan rice production cycle was accessed through these labour exchange institutions. In relation to water management, the kanaway system exists at the present as it has done for as long as any of the farmers I interviewed could remember. In relation to land preparation, many older male farmers commented that they would typically engage in ajon-ajon, with a friend or relative to ease the burden of this laborious task.

In relation to transplanting, the hungos-hungos usually involved groups of 5 or 6 women, typically relatives and close friends, who lived near each other, or whose paddies were located within a short distance of each other. Men tended to use the hungos-hungos for the preparation of their baow fields, within which they would grow maize, camote, and cassava. This was a particularly time consuming task that involved clearing and burning patches of forest left fallow for up to 6 years. Some of the female farmers I spoke with commented that after the demise of the baow system – which came about due to new environmental legislation and problems associated with the insurgency in the late 1980s and early 1990s -- many men no longer participated in hungos-hungos; these women suggested that hungos-hungos, as far as some men were concerned, was explicitly tied to baow preparation. Having said that, some farmers mentioned that hungos-hungos did include both men and women working together on many diverse farming tasks. Clearly, as with most of Campagao's indigenous social institutions, this was a flexible system, based on necessity, cooperation and opportunity.

7.1.5 Land tenure during the kinaraan period

In chapter 5, I outlined the asymmetrical relationship that exists between landlords and share tenants throughout the Philippines; there is no evidence to suggest that this relationship was any less burdensome in Campagao during the kinaraan period. For example, under a typical share tenancy agreement, a landlord's share was either one-third of the net harvest (tinulo), or one half of the net harvest, provided the landlord supplied all the inputs (e.g. carabao, seedlings and fertiliser). Despite the passing of several land reform bills during the latter half of the 20th century (including the Marcos PD 27, 1972 reforms) share tenancy was, and still is, a widespread form of land tenure; indeed, it is one that was, and is, preferred by many of Campagao's farmers. I will discuss the reasons for this in the forthcoming section on agrarian reform during the green revolution.

The relationship between landlord and tenant in Campagao was an affect laden one, where strong ties, developed over generations, are shared between landlord and tenant families. A form of inherited tenancy existed, and still exists in Campagao, wherein the rights to tenancy are passed down through the generations, as are the obligations of the landlord. Despite this form of social security, many farmers recalled that disputes over both the supply of inputs and the size of net harvests were common. Some of the older farmers I spoke with described situations where landlords would periodically 'forget' to supply them with inputs, or would just cease to do so and still retain one-half of the net harvest. Conversely many landlords were required to supervise tenants who they thought were lying about yields. In general, many farmers I spoke with were relatively ambivalent about the conditions under which they farmed during the kinaraan period and suggested that the primary consideration was whether or not the landlord was a 'good person'.

As the previous discussion has suggested, the kinaraan was a largely self contained system of rice production. Rice plant genetic material was sourced locally, the diversity of this material was increased through the efforts of local farmers, and local sources of nutrients were used, as were local methods of pest control. A number of local social arrangements (e.g. hungos-hungos, ajon-ajon, pito-pito, and kanaway) helped farmers cope with the more laborious aspects of rice farming; and the traditional Filipino ritual of patilow was common amongst the local farmers. As we have seen, the relationship between landlord and tenant was a personalistic one, and strong bonding social capital was evident in the relationships amongst farmers, particularly in the labour exchange institutions and the rotating credit and savings associations (ROSCAs). However, the green revolution brought with it inexorable change – in agronomic practice in particular. The next section will highlight the changes brought about by the green revolution, and will also highlight some of the social arrangements that have persisted despite the modernising influence of the green revolution.

7.2 The green revolution in Campagao

President Marcos's Masagana 99 program was initiated in 1973, and was the primary vehicle for the nation's Green Revolution. The Masagana 99 package consisted of a program of collateral free loans coupled with the provision of subsidised modern seed, fertiliser and pesticides. The rationale behind this agricultural development project, the political circumstances surrounding its implementation, and the broader socio-economic consequences of the green revolution in the Philippines have been discussed at length in chapter 5. The following discussion will focus exclusively on the green revolution experience of the farmers of Campagao, and their adaptation to the powerful new technologies introduced through Masagana 99.

Despite the green revolution's 'success' in converting 97% of the nation's irrigated rice land to Modern Varieties (MVs) by 1986 (David *et al*, 1994), the uptake of MVs and green revolution agronomic techniques was significantly delayed in Bohol. For example, the application of commercial fertiliser in Bohol was 'discouragingly low' in 1984 (APC 1986a); almost half of Bohol's farmers still used the tuslo method of fertilisation in 1985 (APC, 1986b); and the use of low yielding TVs was still widespread in the late 1980's (APC, 1989). At a time (1987) when the average national yield was 2.62 t/ha, Bohol's irrigated areas yielded 1.57 t/ha in the panuig season (BAS, 2002). It wasn't until 1995 that combined irrigated and rain fed yields averaged 2 t/ha (BAS, 2002), which was still 0.8t/ha below the national average (FAO, 2000).

7.2.1 The adoption and spread of modern varieties in Campagao

The organisation of Campagao's farmers into kanaways, coupled with their desire to plant in synchronicity to avoid late season rice bug attacks, significantly influenced the adoption of MVs. One kanaway consisting of seven farmers revealed how they all changed from using the kinaraan system one year to full-scale green revolution production the next year (see the case study 1 below for more details). This wholesale change occurred because the farmers wanted to take advantage of the high yielding and early maturing traits of the newly introduced MVs. The widespread planting of early maturing MVs meant those farmers who persisted in the planting of late maturing TVs suffered more and more from late season pest infestations, and this coupled with the impressive yields achieved by their neighbours encouraged Campagao's farmers to use the new varieties. Yields of up to 100 cavans (4 tonnes) per hectare were recorded by some farmers using MVs such as IR66 with the basal application of fertiliser at the prescribed rate; however, few farmers were able to afford the high input costs this new system demanded. All the farmers I interviewed who replaced TVs with MVs during this period maintained that their yields increased significantly in the first few seasons after the transition to MVs. However, in many cases these increases were not maintained, as the costs associated with increased fertilisation regimes could not be borne by many farmers, particularly after one or two crops with less than average yields.

Case Study 1: Iloy's kanaway
The land farmed by Iloy's kanaway is in a picturesque valley in a remote part of sitio Ilaud, approximately 5 kilometres from the national highway (see plate 7.1). In 1958 a group of six men who farmed corn and camote in this valley decided to convert the area to rice farming. They began by building a stone dam, which was a very laborious and time-consuming process, and is probably the largest water management initiative undertaken through cooperative labour in Campagao. The men then constructed canals from this diversion point to their various paddies – some up to 2 kilometres away. In order to maintain the canal – which is made of stones, and clay – the men would meet periodically to clean debris and fix holes in the stonewalls. In 1972

the men decided to meet on a more regular basis, as the canal was falling into disrepair and was taking longer to maintain, since then the group has met every Monday during the growing season(s). In the early years, the men harvested each other's rice using the pito-pito system, and used the money raised to buy pigs for the fiesta. They also used the ihaw-ihaw system to raise money for buying concrete to repair the dam and the stonewalls; as the deterioration of the walls became more prominent, the men decided to impose fines on those who did not turn up to the Monday canal maintenance meetings, thus providing the kanaway with another important source of income, and a source of credit.

The men continued to use the kinaraan system of rice production, as their fathers had, and the men and their families continued farming together, repairing canals together and harvesting together. In 1985, one of the men – whose wife owns a farm in the municipality of Sierra Bullones – was told by a farmer there about the new early maturing varieties that were released by the government. These varieties were not widespread in Campagao at that time. Upon hearing about these early maturing varieties, and witnessing their growth, the kanaway members decided to trial the new varieties en masse. As they already did everything together it made sense to convert the entire secluded valley to MVs, and there were also concerns that if TVs were planted alongside the new varieties they would be inundated with pijanghow (Rice Bug). Due to the short stature of the varieties the men reasoned that they would use less water, they were also impressed by the reports of high yields and the early maturing capability of the new varieties; this was particularly important for Iloy's kanaway because they did not usually plant until late in the panuig season anyway, as much of the water flow in the early season was diverted by farmers downstream of them. Early in the panuig season of 1985 they all decided to entirely change their rice system from kinaraan, which themselves and their fathers had been using for 30 years, to the new green revolution techniques (12 years after the beginning of the green revolution in the Philippines). They bartered with a Sierra Bullones farmer for enough seed to plant out the valley, and set about learning the new fertilisation methods. At this time the farmers closer to the highway were still using lubang with guano sa buho. That season Iloy's kanaway had some spectacular success using the basal application method, and yields increased by up to 300%. Convinced of the viability of the new technology the men continued applying inorganic fertiliser with the new varieties, and learnt more and more about the new green revolution techniques, including the spraying of pesticides; they did this through 'local imitation', and through attending Barangay assemblies and MAO workshops. In the space of one year they has changed from 'traditional' to 'modern' farmers.

The author collected data on the use of 18 rice varieties used by Campagao's farmers during the green revolution. The 13 MVs and 5 FVs recalled by the farmers became the barangay's primary planting material between the mid 1980s and mid 1990s. These varieties largely replaced the 21 genetically heterogeneous landraces grown in the hundreds of years preceding the green revolution. A study conducted by SEARICE during 1994 (CDBC 2001[a]) in 42 barangays across the province discovered only 22 formally released MVs, and 25 TVs; from this we can assume that rice plant genetic diversity was in fact quite low throughout much of the province.

Plate 7.1: Iloy's valley

Many of the farmers I interviewed remembered the 1980s and early 1990s as a time of limited choices, and all commented on the predominance of one variety, IR66. As with lubang and kainte before it, IR66 became the predominant rice variety soon after its introduction into Bohol in 1987. It was particularly favoured in the alkaline areas of southern and central Bohol, but was not as dominant in the more favourable rice growing regions of northern Bohol. It was favoured due to its pest and disease resistance, high yields and adaptability to local conditions; this last trait meant that IR66 could be planted widely throughout the barangay of Campagao. Its tolerance of drought conditions made it particularly attractive to those farmers with rain fed paddies, while its high yielding capacity coupled with its pest resistance made it attractive to those farmers who focussed primarily on producing high yields. The capacity of IR66 to adapt to different landscapes mirrors that of the landraces used during the kinaraan period, and no doubt helped mediate the loss of diversity suffered as a result of the displacement of TVs during the green revolution.

The capacity of IR66 and some other government-released varieties to produce red seed coated off types was particularly attractive to Campagao's farmers. These Farmer Varieties (FVs) were produced between the mid 80s to mid 90s using positive off type selection techniques. As noted previously, Campagao's farmers favour red rice due to its hunger suppression qualities, palatability, and premium market price. The

Boholano preference for red rice has also been documented by Bertuso (2000), and CDBC (2001[b]). Bertuso (2000) used cluster analysis to compare the genotypes of the red rice off types preferred by Campagao's farmers to the genotypes of the MV parent material, and found that the FVs demonstrated a higher polymorphism than the comparatively homogenous parent material, indicating the possibility that the red pericarp trait may be the result of the introgression of alleles from the landraces that were still widely planted in the mid-to-late 1980s. The relatively high degree of genetic heterogeneity among these FVs may also explain why these varieties demonstrate a higher degree of pest and disease and drought resistance than their MV parents, a phenomenon that was mentioned by many of the farmers I interviewed. While IR66 was successful in meeting the needs of a diverse array of farmers, the same could not be said for some of the other MVs available at the time. For example, IR72 adapted poorly to the alkaline soils of Campagao, and many farmers recorded significant losses using this variety in the early 1990s.

As with the kinaraan period, the balo-balo and pito-pito systems continued to be important avenues of seed supply, even more so considering the high cost of government supplied seed. The majority of the farmers I interviewed never purchased seeds from the Municipal Agricultural Office during the days of the green revolution; only a very small minority purchased MVs each and every season. This small minority were a very important source of new high quality seed for the majority of farmers who could not afford such seeds. These relatively affluent farmers increased the volume of MVs available to the general Campagao population who then used the balo-balo and pito-pito systems to access the new material. This new material was then replicated and disseminated on a larger scale throughout the community. Access to high quality government supplied seed was also gained by exchanging seed with relatives from neighbouring barangays and towns, particularly those in more favourable rice growing regions who had already been using MVs for some period of time.

7.2.2 Changes in agronomic techniques during the green revolution

In the early days of the green revolution in Campagao, a transitional period of agronomic adjustment took place wherein the farmers – apprehensive of the new technology and averse to spending relatively large amounts of money on fertiliser – developed a suite of hybrid techniques and experimented with these. The high price of inorganic fertiliser, and its limited availability, made it unattractive to Campagao's poorer farmers. The simple fact was that one bag of fertiliser was equivalent to approximately four days paid labour. With a recommended application rate of five bags per hectare it was obviously a considerably expensive risk, considering the district's variable climate and poor soils. The fluctuating availability of fertiliser, expensive transportation costs, and the exorbitant local interest rates offered by local money lenders also influenced the decision to experiment with hybrid methods.

Many of the farmers I spoke with had been aware of inorganic fertilisers since the 1960s, and some of the more affluent and well-connected farmers began using inorganic fertiliser's quite early in the green revolution. These included Nong Jose Toledo – the current Barangay Captain's father – who built the Campagao commercial rice mill in 1979, and whose family is now one of the biggest moneylenders in the district. As one of the largest landowners in Campagao, and as a former Barangay Captain himself, Nong Jose was a favourite 'target' of the Municipal Agricultural Office, and participated in many early demonstrations of the new technology, and subsequently became an 'ideal' green revolution farmer.

However, aside from the affluent few, who had the connections and finances to avail themselves fully of the new technology, the vast majority of farmers relied upon technical imitation and local experimentation to assess the viability of the new technologies. One prominent hybrid technique used during the early stages of the green revolution involved modifying the tuslo method by replacing guano with inorganic complete fertiliser. This technique was used prior to the widespread introduction of MVs, with TVs such as lubang and kainte. Variations on this included mixing inorganic fertiliser and guano, and mixing carabao wallow and inorganic fertiliser at equal ratios. All three methods were mostly used on TVs, although some farmers mentioned trialling these methods with MVs, without success. After trialling these modified tuslo methods many farmers reverted back to the kinaraan tuslo method, as the modified methods tended to exacerbate lodging in the TVs. From the perspective of a continuum of practice based on the long history of the kinaraan, one can see how Campagao's farmers must have considered these hybrid techniques entirely rational, particularly considering the dominance of the conceptual model of 'starting'.

As MVs became more widely available, and as farmers realised the limitations of applying inorganic fertilisers to traditional varieties, these hybrid practices changed yet again, and farmers began incorporating top dressing techniques into their modified tuslo practice. Again these combinations took many forms, and the form depended almost entirely on financial circumstances. The poorer farmers tended to use a modified tuslo practice, followed by the broadcasting of the remaining inorganic fertiliser – usually at application rates of one to two bags (50 -100 kilos) per hectare. An alternative included using the modified tuslo method with a process called hungit, a labour intensive mode of application wherein fertiliser is applied directly to the base of the rice hills three weeks after planting; while it is a logical fertiliser-conserving method, this practice was not popular due to the excessive labour involved (approximately 5 days per hectare).

As the green revolution progressed, the tuslo methods phased out, and the focus shifted from starting to broadcasting. The farmers of Campagao realised that the tuslo method was contributing little to yield increase, and as such the extra labour costs involved in the practice were unjustified, particularly considering the fact that labour demand for transplanting increased with the introduction of short statured varieties – as will be discussed in the following section. Any available cash was now used to purchase more inorganic fertiliser, for broadcasting or basal application, as it was through these practices that significant yield increases were initially achieved.

Many of the farmers I spoke with realised 100 -200% increases in rice yield in the first few seasons using suboptimal applications of inorganic fertiliser. Those very few who used inorganic fertiliser at the prescribed rate, particularly using basal application, realised 300 - 400% increases in yield. The basal application of inorganic fertiliser was a widely trialled practice, but one that fell into disfavour as the high initial yields plateaued, and as net returns due to a diminishing return on fertiliser investment correspondingly decreased. Almost every farmer I spoke with who used the prescribed basal method mentioned attaining yields of up to 80 to 90 cavans per hectare; these were spectacular yields, considering that a few years before farmers were yielding 25 to 50 cavans per hectare using kinaraan techniques. However, while yields were increasing so were input costs, and as the diminishing returns of basal application became obvious, many farmers changed to broadcasting complete fertiliser, which could be better adapted to the farmers' prevailing financial circumstances. The periodic local unavailability of urea, diammonium phosphate and potash also contributed to a decline in basal application.

Aside from the changes in inorganic fertiliser application that accompanied the green revolution, there is evidence that changes in the utilisation of organic fertiliser sources occurred as well. For example, many farmers commented on the increased use of rice straw alongside the use of inorganic fertilisers. This was influenced by directives from the Department of Agriculture (DA) that threatened to fine farmers for burning rice straw. These directives were made on the basis of research carried out by the Philippine DA that indicated rice straw could provide substantial benefits to resource poor rice farmers. Farmers learnt about the importance of rice straw as a fertiliser at Barangay assembly meetings, and the practice of rice straw composting then spread through technical imitation. Unfortunately, the message about the importance of rice straw was often confusing, as the DA also communicated directives that urged farmers to return to burning rice straw during 'black bug' infestations. Black Bug (Scotinopara coarctata) is a relatively minor pest of rice in the Philippines; it is generally controlled by light trapping, but the burning of rice straw at the end of the rice growing season was a method encouraged by the Philippine DA to break the pest's lifecycle. In relation to other organic fertilisers, there is also evidence that the use of decomposed rice hull (tahop) as a fertiliser became more widespread during the green revolution, as did the use of tahop ash.

Aside from fertilisation, significant changes were also occurring in the field of pest and disease management, the most notable of which was the widespread use of the insecticides recommended by the MAO, and increasingly sold through the market in Bilar. In contrast to inorganic fertiliser, which was prohibitively expensive, pesticides were cheap, and the results were immediately observable. During the early 1980s the use of pesticides such as 'Karate' (cyhalothrin lambda) and 'Thiodan' (malathion/endosulfan) became widespread in Campagao. However, many farmers I spoke with recalled using 'Thiodan' and another pesticide – 'Polydol' – with the varieties lubang and kainte in the late 1960s and early 1970s.

The increasing availability of pesticides was, however, not accompanied by adequate training in both application techniques and health protection. Many of the farmers I spoke with recalled purchasing a 'pesticide', without knowing what it was meant to kill, or how to apply it properly, and many thought that by simply spraying a 'pesticide' their insect problems, whatever they were, would go away. A number of farmers mentioned using 'Bushwhack' (which is a herbicide, 2, 4-D, 2-ethylhexylester) to control rice bug. This practice has persisted since the green revolution; for example, I spoke to three farmers who used Bushwhack to control rice bug during the 2002 panuig season. Many farmers also remarked that protective equipment was non-existent – and is still non-existent if my observations of spraying techniques during the 2002 season are anything to go by.

One of the local Municipal Agricultural Officers commented on the often indiscriminate and ineffective application of pesticides during the early days of the green revolution in Campagao. While the farmers continued to believe that synchronicity was their best defence against insect attack, those farmers in more remote areas, or those who for water allocation reasons could not plant until quite late in the season, applied significant quantities of pesticides, mostly to combat rice bug, armyworm, and caseworm attack.

As we will see in chapter 9, the use of pesticides in Campagao has decreased significantly in the last decade or so, as it has in most parts of Southeast Asia where Integrated Pest Management (IPM) strategies have been widely undertaken. While I do not wish to diminish the success of IPM projects, many of the farmers I spoke with suggested that they became disillusioned with the decreasing impact of insecticides quite early; the farmers recognised that certain insects (rice bug, armyworm and caseworm, in particular) were becoming impervious to pesticide application, and as a cost cutting measure many farmers stopped using pesticides altogether many years prior to the introduction of IPM projects by the MAO.

7.2.3 Changes in labour patterns during the green revolution

The technologies of the green revolution brought about significant changes to labour patterns within the barangay, and these had mixed benefits for the farmers and landless labourers of Campagao. For example, the introduction of short-statured MVs modified the traditional gendered labour patterns that were characteristic of the kinaraan system, particularly in relation to pulling and transplanting. Due to the short stature of the new MVs, they could be planted at a much closer spacing than the varieties used during the kinaraan. They were typically planted at 20 -25 centimetre spacings, as opposed to the 30 - 35 centimetre spacings used for TVs. This substantially increased the total number of hills planted per hectare, and thus the total labour requirement for this task. This had the effect of speeding up the process of transplanting quite considerably – more hills were required to be planted in one day. This, coupled with the fact that transplanters were required to plant in synchronicity, lead to men replacing women as the primary labour for this task, and while some women – those who could keep up with the new increased pace – continued transplanting, the vast majority of this labour was, and is, undertaken by men. As the majority of other rice production tasks were, and are, also undertaken by men – e.g. land preparation and harvesting – women were, and are, left to assist with less burdensome tasks such as fertiliser application, weeding and threshing.

The introduction of the hand tractor in the late 1980s also significantly changed labour patterns in the barangay. Prior to the green revolution, the deep ploughing required for TVs was undertaken using a carabao, which was a very time consuming and laborious process. With the introduction of hand tractors, the time involved for this task decreased significantly – however, the cost increased quite substantially, as the economic analysis in chapter 9 explains. The introduction of hand tractors also limited the opportunities for carabao owners to plough fields as hired labour. However, the widespread dissemination of hand tractors did, and does, employ many landless labourers and resource poor farmers in the district, and is an important source of income for hand tractor owners. The impact on the carabao owners was ameliorated by the continuing necessity to level the paddy fields after ploughing and harrowing with the hand tractor.

The introduction of inorganic fertiliser was another labour saving technology that provided mixed benefits to the community. To begin with, the introduction of inorganic fertiliser significantly reduced the labour involved in the tuslo method by overcoming the need to gather guano; clearly this had significant labour saving benefits for farmers. However, as the tuslo method became phased out, labour opportunities for the landless labourers and resource poor farmers who may have undertaken tuslo tasks (e.g. gathering guano, 'dipping', transporting dipped seedlings) disappeared completely and, as inorganic fertiliser was usually applied by the cultivator, its introduction did not present any other labour opportunities for landless labourers and resource poor farmers.

The displacement of labour that resulted from the demise of the tuslo practice, coupled with the limited opportunities available in land preparation (e.g. hand tractor operator, or carabao owner), meant that pulling, transplanting and harvesting remained the most important labour tasks for landless labourers and resource poor farmers. The pressure in relation to harvesting was particularly acute, and influenced the rise of the bid system described in chapter 6. The farmers of Campagao maintain that the bid system arose after the widespread introduction of green revolution technologies in the mid to late 1980s. The increased yield that accompanied the green revolution clearly made harvesting under the pito-pito system very attractive to resource poor farmers, and to those without access to land, and the increased competition among pito-pito groups led them to bid for more production tasks in order to secure the right to harvest.

Many of the farmers I spoke with also attributed the coming of the green revolution with the demise of the traditional labour exchange institutions, which had formed the backbone of the kinaraan system. As we have seen, hungos-hungos largely disappeared among the male population after the demise of the baow system, and the displacement of women from the task of transplanting contributed to the demise of hungos-hungos in the rice production process. The effort and coordination involved in scheduling cooperative work among members of 5 to 6 households was also a contributing factor in this demise.

Urich (1995), commenting on the demise of hungos-hungos in the neighbouring municipality of Batuan, suggests that the time taken to schedule and wait for such cooperative work delays the harvest date, and this significantly affects the price received for the harvested crop. While none of the farmers I interviewed suggested crop price was a reason for the demise of hungos-hungos, there is no doubt that the time and effort involved in hungos-hungos, coupled with the availability of abundant cheap labour, somewhat influenced its demise. This is not to say that the green revolution meant the end of cooperative labour in the barangay, as the kanaway system continued relatively unaltered by the green revolution, if anything, activities by kanaway groups increased as new canals were constructed, and as kanaways began using ihaw-ihaw and other methods to raise money for canal maintenance. The ajon-ajon system also remained an important labour saving and cost-reducing mechanism among poorer farmers in particular, as they tried to adapt to the increasing costs of green revolution production.

7.2.4 Agrarian reform during the green revolution

While the green revolution brought with it widespread changes in agronomic practice, the changes in relation to agrarian reform were far less ubiquitous. As chapter 5 indicated, the Marcos agrarian reforms implemented in 1972 were seen as the social justice platform upon which the modernising technologies of the green revolution would be based. The idea was to free the share tenant from the shackles of affect-laden and highly inequitable land tenure arrangements, and to replace these informal patron - client ties with formal legal agreements, this would presumably then influence the liberated farmer to use his/her land more optimally. As chapter 5 demonstrated, these efforts were frustrated by landowners and politicians throughout the Philippines in a number of ways, and were more a grand exercise in the 'placation of the peasantry' as opposed to being real redistributive reforms.

As the discussion in chapter 5 suggested, the practical realities of agrarian reform in the Philippines fell woefully short of the stated goals, and this was also the case in Campagao during the green revolution. For example, according to data from the Bilar Municipal Agrarian Reform Office for 2002, only one household out of the 257 in Campagao has benefited from the OLT provisions under the CARP (30 years after the implementation of P.D 27); and only 100 hectares of rice and corn land throughout the municipality has been transferred under the same provisions (out of a total of 2883 hectares of rice and corn land). When I spoke to Campagao's farmers about the OLT provisions under the CARP, many of them had heard of it, but they were unsure when it would be implemented.

And while the performance in relation to lease provision has been much more successful – 560 hectares of rice and corn land is now designated leasehold land in Bilar – in a large number of cases, these leases are ineffectual because they failed to address the concerns of farmers in marginal rice producing areas. The provisions of the Marcos agrarian reforms gave share-tenant farmers leaseholder status, with the obligation to pay one-fourth of the net harvest to the lessor each season – the one-fourth figure was agreed between the owner, lessee and agrarian reform official, and was calculated by averaging the previous three years' yields. However, every green revolution farmer I spoke with who farmed land in a rainfed or floody area of Campagao either refused to take advantage of the agrarian reform provisions, or signed a lease agreement in the presence of agrarian reform officials only to revert back to the previously – now presumably illegal – share-tenancy practice that characterised the kinaraan period.

While many of the farmers I spoke with thought the one-fourth figure fair, they were concerned because the figure was fixed – i.e. it had to be paid every season despite fluctuations in yield. As will become clear when I discuss the field data for 2002 in chapter 9, yields within the barangay fluctuate widely, and yields within individual farmer's paddy environments also fluctuate widely. Those farmers with fluctuating yields, particularly those in rainfed environments, preferred the security of the tinulo arrangement, which required them to pay one-third of their net harvest, whether that be 10 or 100 cavans.

Despite the predominance of informal and illegal land tenure arrangements, many farmers did take advantage of the agrarian reform provisions, and some benefited from them. For example, many of those who signed and legally abided by lease agreements were farmers in favourable areas, and at the time of signing, many of these farmers were using the kinaraan system of rice production. As we have seen, yields under this system were as low as 25 cavans per hectare; as such, during the early days of agrarian reform, some farmers were paying as little as 5 - 6 cavans per hectare to the landowner. When these farmers' yields increased substantially after adopting green revolution technologies, the five to six cavans remained fixed and the farmers benefited from very favourable leasing arrangements, e.g. some farmers were paying only one tenth of their net harvest in rental.

7.2.5. The demise of patilow

It was also during the green revolution that significant changes in local agricultural-based rituals took place. However, the demise of patilow did not result from any flourishing of modernist thought accompanying the new technologies, but was instead influenced by proclamations from the Catholic Church, and the growth of Catholic family groups such as the Cluster and Couples for Christ during the 1980s and 1990s. These proclamations were particularly effective in curtailing the physical act of patilow, as the following excerpt suggests:

David: So the stopping of the offering of the rice to the *engkanto* coincided with the arrival of the Cluster?
Jo-Jo: Yeah, because they educate the farmer, teach them don't do that one, because those are the bad spirits
David: The bad spirit
Jo-Jo: They are in the hands of the lord…you are serving two, the dark side, that's why they stop the…patilow because patilow is on the dark side. The engkanto is on the dark side.
David: So the people in the Clusters, the people in there they, ah, said don't, they said the engkanto was the bad spirits
Jo-Jo: Yeah
David: So they admitted that they existed yeah?
Jo-Jo: Yeah
David: But they just said that they were bad?
Jo-Jo: Yeah

However, there is evidence to suggest that while the Church was successful in curtailing patilow practice, this did not necessarily extend to negating belief in engkanto. For example, those farmers who wanted to disengage from the patilow ritual had to perform a ceremony severing one's tie with the engkanto – this commonly involved the sacrifice of a chicken – if this was not done then it was thought that the farmer or someone in their family would become ill. Despite the proclamations of the Church, the patilow ritual is still practised by older farmers in Campagao to this day, and the belief in engkanto persists.

The metamorphosis from the kinaraan to the green revolution brought with it significant changes in agronomic practice and social arrangements. A locally based, reproductive system of agricultural production was replaced with a productive system that relied on external inputs, scientific knowledge, economic as opposed to social relations, and legal as opposed to personalistic ties. Despite these significant changes a number of social and cultural elements of the traditional system persisted. For example, indigenous social institutions such as ajon-ajon and kanaway persisted unchanged, the use of labour exchange arrangements such as these continued to be a viable way to offset the increasing costs of green revolution technologies, and the labour involved in irrigated rice production. Pito-pito was modified to include a bid component as a response to increasing pressure to secure a valuable harvest. For those in marginal areas, the maintenance of informal personalistic land tenure arrangements continued to be the best way to adapt to varying conditions. Other agriculture-related elements of the kinaraan also persisted; for example, farmers continued to experiment with varietal selection, and they continued to utilise the genetic heterogeneity of particular rice varieties (e.g. lubang in the kinaraan, IR66 during the green revolution). The data has also demonstrated that the green revolution brought with it many opportunities for experimentation. The various iterations of the tuslo practice demonstrate both the persistence of an agronomic model of production ('starting'), and a capability for innovation and experimentation when introduced to new technologies.

8. Contemporary agricultural development initiatives

Before moving on to discuss the contemporary agronomic practices of Campagao's farmers, as witnessed during the panuig 2002 season, I think it is important to discuss the two very different agricultural development initiatives that are influencing current agronomic practice in the barangay. In recent years the rice growing adaptations of Campagao's farmers have been influenced by two programs: the Community Development and Biodiversity Conservation (CDBC) program – facilitated by SEARICE, which focuses on increasing rice plant genetic diversity, developing locally renewable methods of rice production, and increasing the knowledge and critical awareness of its farmer partners; and the Philippine National Government's (NGP's) *Ginintuang Masaganang Ani* (GMA) program, which aims to increase rice productivity through the promotion of subsidised certified seed and the use of inorganic fertiliser.

In many ways the aims of these two programs are at cross purposes. The GMA program is not too dissimilar from the green revolution *Masagana 99* program – the nomenclature is very similar, as is the focus on providing expensive technical solutions to increasing rice productivity at the national aggregate level. In contrast, the CDBC project provides a more holistic approach to agricultural development that includes locally developed technical solutions (such as new rice varieties, organic methods of rice production), institution building, and the empowerment of resource poor farmers.

The chapter will begin with an overview of the Community Development and Biodiversity Conservation (CDBC) project and the strategies employed by SEARICE to address the many issues that face resource poor rice farmers in Bohol. In doing so, I will highlight the broader transformatory aims of the CDBC project, and how these aims are being addressed through the project's activities. As we will see, the protest activities surrounding the passing of the Philippine Plant Variety Protection (PVP) Act in 2002 is one manifestation of these broader emancipatory principles. Following on from this, I will discuss the history of CFPRA, its activities within the ambit of the CDBC project, and the role it plays in the barangay. I will also discuss the barriers to this organisation's expansion and the impact this may have on the aims of the CDBC project. After discussing these emancipatory and institutional issues I will move on to discuss the two CDBC/CFPRA projects that have had the biggest impact on the post green revolution adaptations of Campagao's farmers, namely the participatory selection and breeding and organic farming initiatives.

The chapter will close with a discussion of the GMA program, in particular its rice productivity initiatives, and the extent to which these initiatives are having an impact in Campagao. I will analyse some of the technical limitations of this project, and some of the local difficulties faced by those charged with its promotion.

8.1 The CDBC program: an alternative development agenda

The CDBC program attempts to arrest the erosion of plant genetic resources that has accompanied agricultural modernisation projects such as the green revolution. In Bohol this program focuses on preserving and enhancing rice plant genetic resources in particular. SEARICE focuses specifically on providing the technological support farmer groups need to preserve and enhance local rice plant genetic diversity, both in situ and ex situ. Facilitators provide training in varietal selection and breeding (e.g. skills training in breeding and selection methods, community evaluations of varietal trials, trial monitoring and record keeping); they source varieties from other regions and countries, and introduce those varieties to partner communities; and they facilitate the free movement of information and genetic material between the farmer groups who participate in the project. SEARICE has provided this technological support to CFPRA since 1996, and now supports seven Farmers' Associations (FAs) throughout Bohol, four of which are in Bilar in barangays close to Campagao.

While, at a practical level, the project has concerned itself with the training of farmers, and the provision of new rice plant genetic material, the focus on increasing plant genetic resources is merely a mechanism through which the NGO can begin to address the plethora of political, social and economic issues that face resource poor farmers in the Philippines. It is these issues that provide the underlying rationale behind the CDBC project, and is how SEARICE interprets its role in the project. The excerpt below extracted from a conversation between the author and Paul Borja, the National Coordinator of SEARICE in the Philippines, expresses the organisation's concern with political and socio-economic transformation. This conversation was immediately preceded by a question from the author about the change in the SEARICE's name from Southeast Asian Institute for Community Education to Southeast Asian Initiative for Community Empowerment:

Paul: It was decided this year I think because institute seems to connote some formal institution or something like that....... so we decided to make it something more of civil society.......anyway we consulted with the board of SEARICE and they agreed to change. And education also seems to be just an education and training, so we want to focus on the empowerment aspect which is technological empowerment, which is farmers getting access and control of their technology; also political........ they would have the voice to speak out on issues on agriculture and also on issues affecting genetic resources, so we decided to broaden. In fact the name of SEARICE to incorporate the larger vision and mission which is really empowerment of farmers in the end, so that's it.
David: So to truly reflect what you're doing and what you want to do?
Paul: So hopefully that...also at this time we are in the process of broadening our work...focus on genetic resources but we want to also slowly address little by little other concerns of the community, there are many other concerns in the community; we still have to learn to do that with the farmers.
David: What sort of concerns are they?
Paul: Well land issues for example, how can you have sustainable agriculture when farmers don't have land, so something like that, maybe we can try to address that issues on farmers' participation in local government, they don't have any voice right now. Issues in socioeconomic............socioeconomic needs for example, so in the process of our community work in the next months or years we hope to get the broader picture, and to get the farmers involved in the process, having organised them already around sustainable agriculture then maybe we can help them address some of the broader concerns in the community, that is the idea, the direction.

Paul goes on to describe the issue of rice plant genetic resources as a 'rallying' point around which farmers can organise, this organisation providing the kernel of a broader empowerment movement that can begin to address the political and socio-economic issues faced by resource farmers in the Philippines.

Aside from training and technological support, SEARICE also believes it has important policy and advocacy work to undertake on behalf of the farmers participating in its projects. During the author's stay in Bohol, this policy and advocacy work coalesced around the issue of plant variety rights; this was in response to the passing in July 2002 of the PVP Act. The Philippine government enacted this legislation in order to conform to the requirements of the World Trade Organisation (WTO), specifically the WTO's Trade Related Intellectual Property Rights (TRIPs) provisions. The PVP act provides for the protection of new plant varieties, and establishes within the Philippines a Plant

Variety Protection Board, whose members will guide the implementation of the Act and decide on some of its more ambiguous provisions. For example, the Act offers some protection for 'small farmers', in that these farmers will continue to be allowed to exchange, use, sell and save seeds, provided these seeds will only be used for reproduction and replanting on their own land. However, the exact application of the Act to 'small farmers' has yet to be determined, and remains a concern for SEARICE and Campagao's farmers.

While the Act may be ambiguous about the rights of 'small farmers', it is much more explicit about the rights of private and public plant breeders, who, under the Act, can apply for exclusive rights over new varieties they claim to develop or discover. The sale, exchange, or use for breeding or selection purposes of these protected varieties is classified as a criminal offence; the Act also extends to varieties that are 'essentially derived' from protected varieties. These provisions will make it illegal for farmers to develop and disseminate FVs from protected varieties – despite the fact that protected MVs provide a vitally important source of rice plant genetic material (as the section below on CFPRA's varietal trials will attest). While it is possible under the Act for farmers to claim exclusive rights over varieties they have developed, the limited resources of farmers preclude them from claiming protection over the FVs they have developed. In the absence of such protection, however, and relying on the discovery provisions under the Act, plant breeders may be able to claim rights over varieties developed by farmers, if farmers or 'bona fide' farmers associations' have not hitherto either registered these varieties or included them in a local inventory.

Since the passing of the PVP Act, SEARICE, CFPRA and many other Bohol based NGOs and People's Organisations (POs) have actively opposed the legislation through awareness raising activities, community protest, and legal means. In Bohol, pamphlets have been produced in the local dialect informing Boholano farmers of the impact of the PVP legislation, farmers from CFPRA and many other POs are holding workshops with their fellow farmers informing them of the impact of the PVP Act, affadavits outlining farmers' concerns were drafted and signed by hundreds of farmers, and thousands of Boholano farmers have signed the Bohol Farmers Network Declaration in opposition to PVP legislation.

Aside from this, farmers and NGOs have organised protest plantings of varieties that may be threatened by the legislation, they have also developed community registries that document all the FVs within a community, as well as protesting against the law in the provincial capital. Many of these activities have been organised by SEARICE, and a number of Campagao's farmers have been very active in this campaign. For example, Cenio Sanchez, the president of CFPRA, travelled to Manila, with the assistance of SEARICE, to talk to Senators about the impact of the PVP act on resource poor farmers.

As the above discussion suggests, the CDBC project has a broad suite of goals in Bohol including: increasing rice plant genetic diversity; promoting sustainable agriculture; technologically empowering farmers; fostering an attitude of critical awareness amongst their farmer partners; building institutions; and establishing connections between farmer groups – all with the ultimate aim of facilitating the social, political and economic transformation of resource poor farmers. At some levels the CDBC project has achieved a modicum of success, particularly in relation to increasing rice plant genetic diversity; however, some of its other goals have been much more difficult to attain, as the following discussion will suggest.

8.2 CFPRA: at the crossroads of the post green revolution

CFPRA is an organisation at the crossroads of agricultural development in the Philippines. As Campagao's formally registered FA, it is the vehicle through which information about the NGP agricultural development initiatives are disseminated, at the same time as being an organisation that actively participates in a program that negates the green revolution – like policies of the NGP. As we will see, it is a relatively small institution that has, despite its vibrancy and internal activity, experienced difficulty recruiting new members; and it is an organisation that depends heavily upon the guidance and facilitation of its NGO partner.

Prior to the establishment of CFPRA, a government-sponsored FA was in existence in Campagao during the 1980s and early 1990s; however, according to some former members, this organisation was dysfunctional and unfocused. Former FA members pointed to two main reasons for the old organisation's failure and eventual abandonment in the early 1990s – these included financial mismanagement, and a lack of initiative by, and interaction with, the Municipal Agricultural Office. In relation to the former, farmers were concerned by the failure of the FA president to ensure the organisation's fund raising activities were managed appropriately; the perceived mismanagement included a failure to ensure that rotating credit and savings rounds reached their completion. Members of the old FA were also concerned by a lack of what farmers in Campagao refer to as 'follow up'. 'Follow up' refers to interaction between people or institutions outside of a formal setting, such as a meeting. For example, farmers found it difficult to get government agricultural technicians to personally attend to their problems, and to initiate projects: that is, to 'follow up' on what they talked about in FA meetings with actual projects or through personal visits to farmers' paddies. Direct personal interaction in a non formal setting is, as the discussion below will attest, crucial to the success of local agricultural initiatives.

Following the collapse of the government sponsored FA, the next opportunity for organisation came about during the NGP's Kasakalikasan program – an integrated pest management program that took place in Campagao in 1995. Sixteen Campagao farmers participated in that program and it was these farmers who were approached by SEARICE and asked to participate in the CDBC project in 1996. This occurred after a serendipitous meeting between Paul Borja and Cenio Sanchez – who at the time was an active participant in the Kasakalikasan program. The excerpt below, from one of the author's interviews with Paul Borja, describes the circumstances around this chance meeting, and the motivations behind Cenio's willingness to participate in the project:

> Paul: At that time we selected Bilar because one of our partner organisations was the Social Action Centre – a church-based organisation, and they had a project there. I used to work there, so we asked them if they could provide some contacts. Actually Cansumbol (a *barangay that neighbours Campagao)* was originally the one and then we went to Cansumbol and tried to organise a group there. At that time we were also doing some research on farmer varieties and farmer selection and we accidentally came across Cenio (*Cenio Sanchez)* during one of our trips....... we stopped by at his house and we said we were looking.......... doing some research, looking at how farmers are managing their rice and all that, he became interested and

shared with us his experience cause he was also before that – I don't know if he told you already – he tried to breed rice by putting them, planting 2 varieties side by side, he thought it was like corn..........we heard about that, he was interested in breeding so we asked him would you like to join us for a workshop we will be discussing about this, sharing the results of our research we are planning to organise some communities to do this activities on conservations? He said "OK I'll try". So that's how it started, that was in 96...accidentally we met Cenio, at that time they just finished the IPM training part from the government but there was no follow up activities so after seeing that's it.........there was knowledge about pest management and all that but there was no follow up from the DA, so he felt that, they were already organised might be a good idea to...NGO might be able to assist us, that was his thinking at the time...

Cenio and two fellow IPM farmers, Nang Upe Dispo and Nong Joey Tejada (both well-respected and very socially active citizens of Campagao) were able to convince their fellow Kasakalikasan farmers to attend a SEARICE-led season long farmers' field school in 1996. At the field school, this original group of 16 farmers participated in trials that showcased ecological approaches to rice production, such as organic fertilisation, ecological pest and disease control, and the importance of enhancing rice plant genetic diversity. After this field school, this coalition of like minded farmers decided, at the urging of SEARICE, to establish a formal organisation.

With the help of SEARICE facilitators, CFPRA established a formal constitution, elected representatives, and began meeting on a regular basis to discuss possible agricultural development initiatives, at a purpose built location in purok Centre 2 (see plate 8.1). Over the years these initiatives have included: establishing an *ex situ* seed bank; increasing rice diversity through breeding and varietal selection (see plate 8.2); trialling organic fertilisers of various kinds; trialling vegetables and root crops; establishing a *ripa* and a loan facility; establishing a registry of farmer varieties; attending workshops on ecological farming techniques, in the Philippines and abroad; and holding workshops with farmers from other POs.

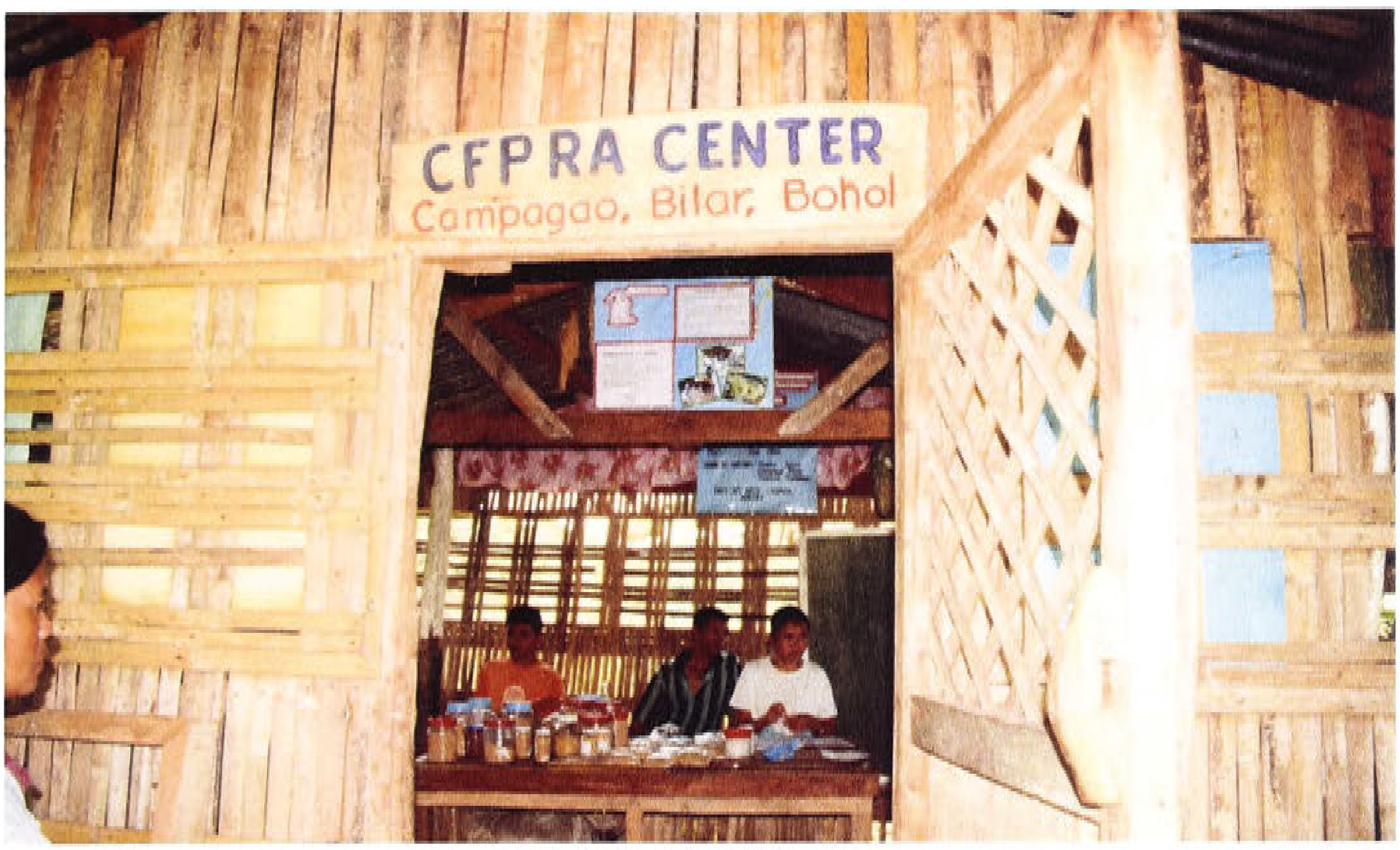


Plate 8.1: The CFPRA centre

The technological expertise and ideological guidance of SEARICE's facilitators has played a crucial role in the development of CFPRA's initiatives. SEARICE's facilitators attend every meeting of CFPRA and provide technical agronomic advice on everything from pest and disease management to the science of genetics; they also help raise the critical awareness of CFPRA's farmers by discussing the contemporary agricultural development issues that face resource poor farmers; and they participate as equal partners in the fund raising and social activities of their farmer partners. Through this long term interaction, many personal relationships have been formed between CFPRA's farmers and their NGO partner. SEARICE's facilitators are masters of the 'follow-up'.

Despite the important technical, social and educational role CFPRA has played in the lives of its members, the organisation has been slow to expand its membership to the broader community. For example, between 1996 and 2002, the organisation increased in size from 16 to 26 active members. While much time and energy has been devoted to CFPRA's internal activities, not much emphasis has been placed on increasing the size of the organisation through active recruiting – despite the goal of the CDBC project to progressively expand intra-and inter-barangay participation in their projects. The farmers who have joined the organisation since 1996 have either been relatives or close friends of long term members, whose motivation to join CFPRA has largely stemmed from a desire to access the new rice varieties being used by CFPRA's members, or to get access to the chicken manure that was supplied to CFPRA members through the organic farming initiative.

Plate 8.2: Farmer varietal trials, Campagao

When I interviewed non-CFPRA farmers and asked them about their knowledge of CFPRA, I was surprised to learn that quite a few farmers had not even heard of the organisation – these included close friends and relatives of long term CFPRA members. Furthermore several farmers told me they were too busy to consider joining CFPRA, or that they were ashamed to just invite themselves to CFPRA meetings. I assumed that, as far as CFPRA was concerned, many farmers were either too busy with their own livelihood concerns to spend time participating in CFPRA's activities, or were too shy to participate without an invitation. I also assumed that the compulsory attendance of a sustainable agriculture orientation seminar and the compulsory participation in CFPRA's ripa- ripa and abuno may have also deterred some farmers – particularly considering the fact that many farmers are participating in several rotating credit and savings schemes at once. On the whole, however, I was surprised that an organisation such as CFPRA, which was so active, and which had contributed so much to the barangay – primarily as a source of new rice plant genetic material – was not more popular with Campagao's farmers. While some of this ambivalence could be put down to previous bad experiences with DA-run FAs, I thought there must be something else behind it.

Towards the end of my field work in Bohol, a conversation I had with one CFPRA and one non-CFPRA member gave me a clue as to why Campagao's farmers may be reluctant to join CFPRA – an excerpt from that conservation is below:

David: Nang, just a question about CFPRA. Do you think CFPRA should expand in size and have more members?
Anon: As of now the CFPRA according to her, nobody enter now or join the CFPRA…but still some also quit in the CFPRA, no additional but there is a decrease.
David: Do you think that…….would you like it if CFPRA increased in size? Do you think the organisation should be bigger than it is?
Mum: She like also that there is an increase cause maybe the aim of the CFPRA is also good………what she is…….she discouraged to enter because there was already a feedback that later on they will be outlaws, they will become outlaws…….the NPA (New People's Army).
David: Who's that…CFPRA?
Anon: That is only the feedback.
David: From?
Anon: What she heard.
David: Who did she……?
Anon: Hearing, it is a rumour now in the CFPRA, if you are a member later on you will become NPA….so she likes to live peacefully…
David: Does that rumour have any basis, what does that rumour mean?
Anon: Somebody discourage them because she was the secretary of the barangay, somebody ask her, do not join in CFPRA cause that is the work of the outlaws. The NPA later on because it was already observed in Mindanao………….. all NPA is now a member of that organisation…so that is a rumour that somebody told them so that discourage the people here in Campagao.
David: Have you heard of that nong?
Anon: Yes they heard.
David: You heard?
Nong: Yes.
David: You heard that CFPRA was associated with the NPA?
Anon: CFPRA, they have no gun but maybe it's only an organisation, later on…there is already an outlaws, a leftist, we call that leftist, the communist, the background of that is communist…the one supporting sometimes is communist.
David: Had you heard that rumour before nong about CFPRA did he hear it in particular?
Anon: There was a person who was caught a member of this organisation.
David: CFPRA.
Anon: Yes…and he reveal that this organisation is back ride already by the NPA.
David: Somebody.
Mum: Communist.

Needless to say this conversation intrigued me; could it be the case that the history of communist insurgency and the continuing presence of military personnel in Bilar had predisposed people against participating in programs run by NGOs that were considered 'leftist'? Did the fact that CFPRA, as a registered farmers association endorsed by the LGU (Local Government Unit) and supported by the barangay captain, not convince Campagao's farmers of its non – insurgent intentions? Or was it the case that the history of insurgency had instilled in Campagao's farmers a desire to avoid all association with organisations that could be considered anti-government?

A further interview I conducted with a farmer active in the human rights group ALAB suggested that there may be something else fueling this perception:

David: Nong have you heard any rumours or any ideas from other people that some people think that CFPRA is not a farming organisation but something else?
Anon: He also heard that rumour.
David: What is that rumour?
Anon: He heard rumours that CFPRA is being supported by anti-government NGO.
David: Anti-government NGO…and what do they mean anti-government NGO, what does that mean, is that related to some group or…cause you're in the government, you are the government.
Anon: This rumours just spread because the government employees also are being…having also this…NGOs are being supported by this leftist.
David: So government employees which government, like LGU employees?
Anon: The DA personnel, the agrarian personnel…the municipal agricultural agrarian officer…he said to me that why should I be partner of NGO…I laugh at him and say what has the government done to me also…I was kidding to him.
David: So in the Campagao community there are some people who believe or you have heard a rumour that CFPRA maybe associated with some leftist group?
Anon: That is their idea…as far as we know even a bit of a suspicion I do not know…I have not heard for long years being a partner of SEARICE.
David: Completely baseless allegation do you think nong?
Anon: Yes.
David: No truth in that one?
Anon: Nonsense.
David: Why do you think people from the government would make up that rumour?
Anon: I think they got that from the high level of the government…just a rumour but it will spread all over the country.
David: Do you think that that rumour could stop people joining an organisation like CFPRA cause they are scared of being associated with that?
Anon: There are some people being discouraged by those rumours but some are not…we'll just keep on our activities and show the people that we are not supported by any other group.
David: That's interesting…so is it common for people who are not members of CFPRA to talk about that, have you had conversations about that…with people who are not members of CFPRA?
Anon: But not all the times we are being accused of that only sometimes people get together those who are not members of CFPRA they have the suspicion, I don't know any members who are convinced by these people, we just keep on working we just keep our activities, we will not be discouraged by their suspicion.

The above except suggests that there may be real tension between those who work promoting the government's agricultural development initiatives and those who are aligned with NGO activities. And it may well be the case that the history of insurgency and the widespread mistrust of 'leftist' political views that exists amongst this conflict-weary population is being exploited by government employees who hope to undermine the programs of SEARICE. This tension between the government view as expressed by its technicians and the view of CFPRA's farmers is manifested in CFPRA meetings almost every time a government agricultural technician attends a CFPRA meeting, as the excerpt from my field journal below suggests:

CFPRA meeting 5 June 2002

From the reception the government agricultural technician received it was clear that she was telling the farmers something they were opposed to. Mum Nene told me later that the technician was encouraging the farmers to use certified and hybrid seeds, and inorganic fertiliser to raise production levels. She also told them that the president has launched a new farming program that will provide farmers with more resources. Mum Nene said that the farmers doubted that they would see any of it, and criticised the government for providing seeds, while being unaware of the damage those seeds may cause the people. The farmers were particularly concerned by the sterility of the hybrid seeds, their high cost, and the fact that they were unproven in their rice paddies. From the expressions of the farmers, their body language and the heated response the agricultural technician received it was clear the CPFRA farmers thought the DA could do very little for them (many people walked outside and talked while the technician was talking). Joey, Catalino and Cenio were particularly vociferous.

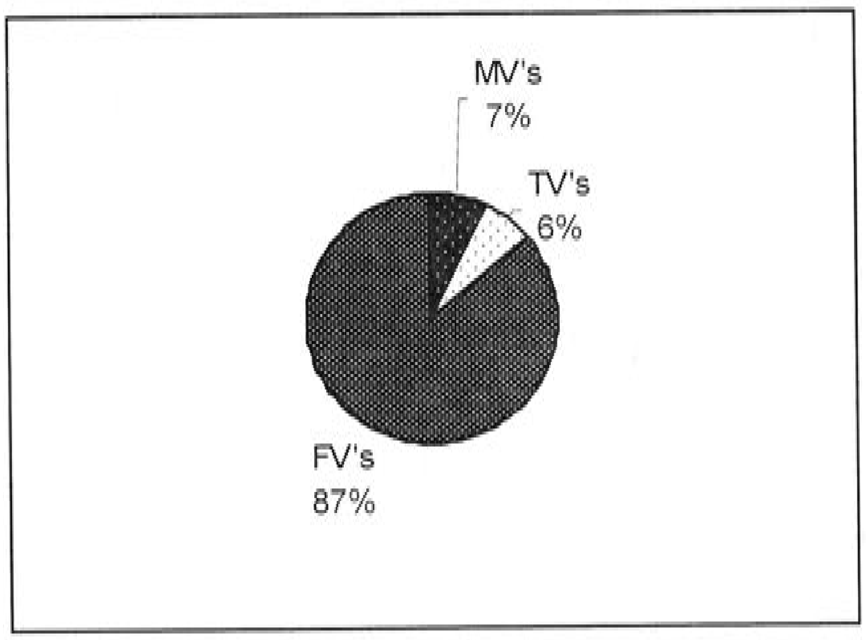
The disjunction between these two views, and the considerations these disjunctions point to in relation to the concepts of subaltern knowledge and transformatory participatory development, will be discussed at length in chapter 10. I will now move on to discuss how these alternative views are manifested through the activities of CFPRA.

8.3 The participatory selection and breeding initiative

The primary activity of CFPRA since its inception in 1996 has been the in situ trialling of rice varieties by its farmer members. The CFPRA/CDBC participatory selection and breeding initiative has two primary aims: the first is to increase the diversity of the rice plant genetic resources available in the barangay, and the second is to empower farmers by helping them develop the knowledge they need to select rice varieties that are well suited to the conditions of their rice paddies. In relation to the former, SEARICE began by collecting 52 rice varieties (MVs, TVs and FVs) from 10 towns around Bohol in1996; these varieties were distributed to 69 farmers in the three barangays where SEARICE had carried out farmer field schools, including Campagao. During this first season, the CFPRA farmers were exposed to a variety of field assessment methods that included making both qualitative and quantitative observations. Farmers were subsequently encouraged to carry out on-farm field trials by themselves and SEARICE coordinators worked with farmers to assess these trials each season.

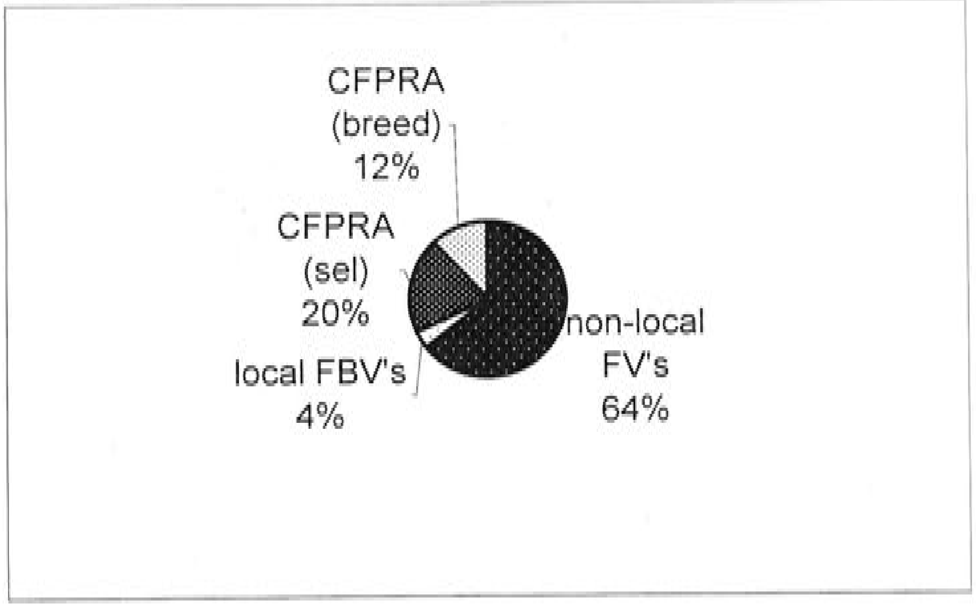
Between panolilang 1996 and panuig 2002, the farmers of CFPRA carried out 583 individual varietal trials; during this time, a total of 233 different rice varieties were trialled in lowland rain fed and lowland irrigated paddies throughout Campagao. Figure 8.1 summarises the varietal classes trialled by CFPRA farmers during this period.

Figure 8.1: Varietal classes trialled by CFPRA farmers 1996 - 2002 (Author's field work 2002)



The majority of the varieties trialled were FVs; this class includes varieties acquired from non-local sources, those developed by CFPRA farmers through selection and breeding, and those bred by a farmer from a neighbouring barangay who is also a CDBC project partner, as summarised in figure 8.2.

Figure 8.2: Types of FVs trialled by CFPRA farmers (Author's field work 2002)



The non-local FVs were obtained by CFPRA farmers through field schools they attended throughout Bohol and in other parts of the Philippines, especially Mindanao and Negros. These FVs were also obtained by SEARICE coordinators from other farmer groups they were working with in Bohol and Mindanao, as well as from locations overseas, most notably Thailand and Vietnam. These varieties typically have local names that may describe the origin of the variety, its characteristics, or its parentage. Of the 129 non-local FVs trialled between 1996 and 2002, about 15% have been used in production on an ongoing basis; and they have proved useful as material for off type selection and breeding by local farmers. And some of them, most notably the Vietnam variety, has played a very important role in the post green revolution adaptations of Campagao's farmers (as chapter 9 will explain).

As the CFPRA varietal trials progressed, the farmers became more comfortable with their assessment of rice characteristics, and many farmers who had no previous experience with varietal selection began selecting their own varieties. In total, 40 selections were developed by CFPRA farmers between 1996 and 2002. Most of these varieties were selected from off types of non-local FVs or off types of IR66, using panicle selection for the development of characteristics, alternating with positive mass selection for increasing the volume of seed supplies.

The 26 CFPRA bred varieties developed between 1996 and 2002 were bred by one farmer who has a particular interest in breeding and off type selection. Cenio Sanchez, the president of CFPRA, learned to breed rice while attending a farmers' field school on rice breeding in Cotabato in 1996, at the invitation of SEARICE. On his return to

Campagao, he began breeding varieties that he thought would adapt to his low input, organic system of farming. For a long time, Cenio had recognised traits in four varieties that he wanted to replicate and he was determined to create new varieties from these four. He has used a process of panicle selection alternating with positive and negative mass selection to develop traits and stabilise his varieties over seven generations. Many of these varieties are now stored in the seed bank maintained by the Central Visayan State College of Agriculture, Forestry and Technology – who, in partnership with SEARICE and CFPRA, have been active participants in the trialling and *ex situ* conservation of FVs.

The 15 TVs trialled since the inception of the CFPRA/CDBC project include landraces that had previously been discarded by Campagao's farmers during the 1980s, including lubang. During the course of the trials, these varieties were similarly discarded, and it was rare for any of these landraces to make it past a one season trial, principally because of the late maturation of these varieties. However, as with the kinaraan–green revolution transition, quite a few glutinous TVs were carried over and continue to be used in production.

The MVs trialled between 1996 and 2002 included formally released varieties such as PSBRC4, 10, 12, 14, 22, 24, 30 and 32; as well as varieties developed by the International Rice Research Institute (IRRI), such as IR24, 36, 42, 64 and 74. These varieties were discarded for a variety of reasons, including poor pest and disease resistance, drought intolerance and an inability to adapt to the local alkaline soils, and in the latter year trials disappeared altogether. Despite the availability of these alternate MVs IR66 continued to be the most popular MV planted during the 1996–2002 period.

Despite the high number of varieties available to CFPRA farmers over the years, there is no doubt that certain varieties have demonstrated superior adaptability, and manage to fulfil many more of the characteristics preferred by CFPRA's farmers. One of the best results of the CFPRA/CDBC program has been the discovery of Vietnam, which, is now beginning to dominate the planting landscape of Campagao. In 2002, CFPRA was beginning to trial other Vietnamese varieties that were thought to be from the same breeding lines as Vietnam, and in the future these varieties may further expand the options of Campagao's farmers. It is the expansion of options and the development of varieties that achieve mutli dimensional goals that make CFPRA's trialling and selection work so important.

8.4 The SEARICE/CFPRA organic farming initiative

Shortly after the partnership between SEARICE and CFPRA was established, SEARICE set about examining the extent to which organic production methods could aid CFPRA's farmers. This focus on organic production forms part of the broader interest SEARICE has in technological empowerment and in promoting the use of inexpensive renewable resources. During their discussions with CFPRA's farmers, SEARICE realised that one of their major considerations was the high cost of inorganic fertiliser and the unavailability of alternative methods of fertilisation. This, coupled with a lack of soil fertility after years of inorganic fertiliser application, encouraged SEARICE facilitators to find alternatives.

SEARICE facilitators were able to access chicken manure from local poultry farms, which they provided to CFPRA farmers through a system of credit, which obliged the farmers to pay for the fertiliser after the harvest. The SEARICE facilitators suggested a staged approach to the application of organic fertiliser, which involved first trialling a small amount of chicken manure in one part of a paddy, then expanding to the entire paddy, and so on over the seasons, until all paddies were fertilised with the appropriate amount of chicken manure.

However the aim of the project was not just to replace one fertiliser with another, the organic farming initiative was seen as complementary to the varietal selection and breeding work also being undertaken as part of the SEARICE/CFPRA partnership, in that the farmers were encouraged to match varieties and fertilisation regimes to rice paddy conditions in a way that enabled them to adaptively manage the rice production system as whole. Once the transition to organic farming had been made and soil fertility was re established, CFPRA's farmers could then presumably reduce their input costs and increase their net production. Indeed the desire to reduce the expense associated with applying inorganic fertiliser was one of the main reasons CFPRA's farmers were attracted to the organic fertiliser trials.

Between 1996 and 2002, all of CFPRA's 26 farmers had trialled chicken manure at some stage, and many of these had taken advantage of the credit supplied by SEARICE to purchase chicken manure. However, at the time of my field work in 2002, only seven CFPRA farmers used organic material other than rice straw in any one of their areas and only five used organic material other than rice straw in all of their areas. Of these five, only three could be said to have made the transition to organic as a result of the SEARICE/CFPRA chicken manure initiative – these three farmers (Guadalupe Dispo, Carmen Bucar and Cenio Sanchez) are three of the most active farmers in CFPRA and all had made the transition to organic, in all of their areas, many years earlier. A number of CFPRA farmers had used organic production techniques for several consecutive seasons, and many still hoped to make the complete transition to organic.

Over the years CFPRA's farmers had noticed a number of benefits associated with organic fertilisation: it improved soil condition by reducing the 'hardness' of the soil and improving its colour and structure; it was relatively inexpensive compared with inorganic fertiliser; it promoted gradual growth and full grains; and it produced quality rice that tasted good and that could be sold at a premium. This premium was paid by SEARICE, who sold the organic rice to another NGO who marketed organic rice in Cebu City. However, alongside these known benefits were a number of negatives that participants in the organic trials experienced.

Firstly, the quality of the chicken manure varied considerably; for example, in the two seasons prior to panuig 2002, the chicken manure was wet and odorous; thus many farmers found it hard to find labourers to apply the fertiliser, and many were concerned that they were not getting value for money, as the chicken manure contained a large quantity of sand and other impurities. Secondly, many farmers – particularly those with larger than average areas – realised that the labour and transport costs involved in organic fertiliser application were larger than they had anticipated, which forced some of them to restrain the size of their organic trials. Thirdly, some farmers missed out on chicken manure orders due to the late or early canvassing of SEARICE facilitators; this was particularly the case for those rain fed farmers who planted late in the season. Fourthly, some farmers commented that organic fertiliser did not encourage vigorous growth, and that rice plants fertilised with inorganic fertiliser matured sooner – one farmer referred to this as 'slow and long' growth. The case study below emphasises many of these points.

Case Study 2: Tony Balio

Tony lives with his parents in a remote part of sitio Ilaud near the Bilar River. He farms approximately 2.3 ha of rice land, which is divided into three land parcels. Two of these parcels are about 1 ha in size and are owned by the Cahiles and Micalob families, who have been the Balio's landlords for 3 generations – Tony's father was one of the original members of the kanaway that built the dam and canal system described in chapter 6. The Balios pay one-third of their net harvest to their landlords and deduct the cost of any fertiliser, and the pito-pito share from their gross harvest. The remaining land parcel farmed by Tony is owned by his family, and is approximately one-third of a hectare.

Tony has been a member of CFPRA since 1999. He was attracted to the organisation because he wanted to access new rice varieties, and to learn ways to increase the productivity of his rice paddies; he is very active in that organisation and has a very keen interest in trialling different rice varieties. In 1999 he began using chicken manure in his 0.3 ha area and over the years has applied approximately 50 bags of chicken dung to that area. During panuig 2002 he stopped applying chicken dung in order to trial rice straw only. However, he has never applied chicken dung to his two larger areas, and has no intention of doing so. The excerpt below describes some of the reasons why:

Aling: He chooses the complete fertiliser because the plant will grow healthy than the organic fertiliser.
David: And what do you mean by growing healthy…grows fast?
Aling: Yeah, grows fast and bears fruits at an early time.
David: So you think the complete fertiliser is good for one area but not good for another area?
Aling: In his area, the 2 hectares it's much preferable to use the complete fertiliser than the organic fertiliser.
David: But you're conducting a trial of organic in your one-third?
Tony: mmm
David: Is that trial with a view to eventually change the whole area to organic?
Aling: The reason behind why he is using that fertiliser that inorganic fertiliser because the inorganic fertiliser is easy to apply and not laborious not like the organic fertiliser it needs a lot of people to do the work; it's too laborious than the inorganic.

Aside from early maturation, and increased labour costs Tony is also concerned by the high transport costs for chicken manure which, for his two hectares, would add 500 pesos to his input expenses. This coupled with the extra labour costs have influenced Tony's decision to restrict his organic experimentation to his smaller area.

During the panuig 2002 Tony's two large areas where affected by a fungal disease that reduced his gross harvest by over 50%. Tony was unable to cover the expenses for his one ha Micalob area where he harvested only 15 cavans – he harvested 18 cavans in his 0.3 ha 'organic' area.

Perhaps the largest impact on the organic fertilisation trials came early in 2002 when CFPRA's farmers were told that they could no longer avail themselves of the credit facility supplied by SEARICE, and that all future chicken manure purchases would have to be paid cash on delivery, at a cost of 65 pesos per bag. An outstanding debt of 20,000 pesos had made the extension of any further credit to CFPRA financially unviable for SEARICE, and the poor repayment levels were affecting the organisation's viability, as those farmers with outstanding debts were becoming inactive. This credit restriction had a significant impact on chicken manure orders during the panuig 2002 season - only two farmers ordered chicken manure for that season.

The restriction of credit for chicken manure, coupled with its poor quality in the previous two seasons, forced many CFPRA farmers to use inorganic fertiliser during the panuig 2002 season; this fertiliser was readily available on credit from the local Campagao store. In some cases, good results were obtained using inorganic fertiliser, particularly after many applications of organic material. A number of farmers commented that they preferred to use chicken manure, and still hoped to make the transition to organic, but that they were merely 'trialling' inorganic fertiliser in some of their paddies. Other farmers who had applied organic fertiliser for some time simply relied upon rice straw in their 'organic' areas, and hoped that a cheap reliable source of organic material would shortly become available.

The ultimate aim of many of the CFPRA farmers I interviewed is to emulate what Cenio Sanchez has achieved in his three areas (see case study in chapter 9), i.e. they hope to adaptively manage the long term soil fertility of their rice paddies at the same time as saving costs in the short term – without affecting their gross margins. However this is by no means a simple process. One requires the necessary financial, physical, institutional and human capital resources to make this happen. SEARICE recognises the importance of helping farmers make this transition and to this end they have devoted much time and effort to promoting the use of locally renewable sources of organic material.

However, my interview data suggests that the labour involved in the production of compost is a major deterrent to the development of large scale composting - many of the farmers I have interviewed simply state that they would not consider this option, while others, primarily those who have already gone through the organic transition, don't see compost production as a significant burden, if it allows them to maintain their organic status. SEARICE's facilitators acknowledge that the use of chicken manure has been problematic, and that the provision of credit to CFPRA produced a dependency that has affected the success of the program. It remains to be seen if the organisation can overcome this dependency and develop independent locally renewable methods of fertilisation that will help its farmers realise their organic farming goals.

8.5 GMA in the barangay

Within the Municipal Agricultural Office (MAO), the focus on farmer participation and empowerment so prevalent within the CDBC project is largely absent. Here the primary aim is to promote the high input packages that constitute the NGP's GMA program. The GMA program is the primary agricultural development initiative of the Philippine Government; it is one of the President's most high profile development programs – and one of its most lofty goals is to secure national rice self sufficiency by 2006. In relation to rice production, at the municipal level, this program involves promoting the use of certified inbred and hybrid seed, and the optimal use of inorganic fertiliser.

During the panuig 2002 season, the agriculturalists from Bilar MAO were promoting the use of three varieties in particular: PSBRC82, PSBRC18 and PSBRC80. Hybrid rice seed was largely unavailable in Bohol during the panuig 2002 season; only 503 bags of the PSB72-H variety were distributed to Bohol's farmers during that season. However, these volumes were expected to increase significantly as local production of hybrid seed increases (Sumatra, 2002). As a result of subsidies provided by both the national and provincial governments the PSBRC18, 82 and 80 varieties were provided to Bohol's farmers at a cost of 325 pesos per bag. These varieties were promoted to Bilar's farmers through meetings of barangay Farmer's Associations and through barangay assembly meetings, just prior to the beginning of the planting season in May and June, 2002.

Despite the subsidies provided by the government and the supposed high yielding nature of the certified varieties, the data I gathered during my field work in Campagao suggests that these varieties were not favoured by resource poor farmers for a number of reasons: cost, late maturity and sickliness, in particular. These varieties also seem to be much less popular than IR66, which, as we have seen, has been one of the more successful MVs introduced by the Philippine government. Some of the agriculturalists I spoke to from the MAO expressed frustration at the slow uptake of these varieties during the panuig 2002 season, and they put this down reluctance by farmers to pay for rice seed, and to a perception amongst some farmers that these varieties are not suited to the climate and soils of Bilar. According to the Municipal Agriculturalist, many farmers approached him concerned by a 'yellowing' associated with the PSBRC82 variety, which he thought may be due to 'some micro-organism' – this sickliness was also brought up by some of the farmers I spoke with who had planted this variety.

The MAO Agriculturalists I spoke with confirmed that the majority of the certified seed distributed during the panuig 2002 season was sold to so-called 'targeted' farmers, that is farmers who, like Boy Toledo, purchase new seed from the MAO each and every season. The more resource poor farmers prefer to rely upon the traditional systems of seed supply to acquire new planting material; these systems also allow farmers to witness the growth of untried varieties prior to their use in production.

Aside from concerns about the cost and suitability of its rice production package, the MAO has more fundamental problems with the promotion of information. MAO agriculturalists are frustrated by their lack of penetration into the barangays; they find it very difficult to get information about their activities and their technologies to those farmers who are not members of registered farmers' organisations. This frustration was expressed to me on more than one occasion by the agriculturalist responsible for promoting the MAO's activities in Campagao. Due to the high cost and time associated with individual farm visits, the MAO 'extends' knowledge of its packages to farmers through its official institutional channels.

At the barangay level this occurs through meetings of the local farmers association, and through the local barangay cooperative. If we examine the case of Campagao, only 26 farmers – or 26 households out of 252 – are represented in CFPRA, and even fewer than that are members of the barangay cooperative. If we couple this with the fact that CFPRA's members have a relatively hostile attitude towards the high input technologies of the Philippine government, then we could assume that CFPRA farmers are hardly giving glowing accounts of these technologies to their fellow barangay residents. While many of the non-CFPRA farmers I interviewed had heard of the varieties being promoted by the MAO, they were not aware of the subsidisation program and not one of the 25 non-CFPRA farmers I interviewed had received any personal advice from the Agriculturalist responsible for their barangay. The vast majority had also not participated in any MAO or DA programs in their whole life as farmers in Campagao. If one considers that SEARICE also has projects in the barangays of Cansumbol, Zamora and Riverside, one could assume that very little information about MAO projects is reaching 'non-targeted' farmers in those barangays as well.

Thus, the success or otherwise of information transmission between the MAO and resource poor farmers is directly related to the representativeness of the local FA and the disposition of FA members towards the Government's agricultural development initiatives. With this in mind, one would expect the MAO to focus on establishing better 'follow-up' with farmers' associations; however, there is little evidence that this is occurring. For example, in Campagao the MAO has essentially conceded that CFPRA is an antagonistic FA and, as we have seen above, there is a suggestion that employees from the Municipal government may be actively undermining the organisation.

The local Agriculturalist periodically attends CFPRA meetings to inform the members of the MAO's programs, but there is no follow up and no interest shown by the MAO in the activities of CFPRA. Indeed, as my field notes from a discussion with the Municipal Agriculturalist infers, the main activity of CFPRA (i.e. participatory plant selection and breeding) is something that is considered beyond the capabilities of local farmers:

Field Journal 2nd September, 2002.

Interview with Municipal Agriculturalist

In relation to rice breeding and selection Nong was of the opinion that this was"a very hard and delicate activity, we rely on national agencies to do that". When I told him that one CFPRA farmer had bred 26 rice varieties, and that farmers in other barangays were successfully doing the same, and that many of these varieties had been used in production over the years, he thought I must be mistaken and that I must mean they are selecting their own varieties which they have done for years. Nong said:"at university rice breeding and genetics was the hardest course". He said this in a very dismissive sort of way, which seemed to infer that farmers couldn't understand the genetics of rice breeding.

Aside from the technological, attitudinal and institutional problems referred to above, the implementation of GMA on the ground is also affected by antagonism within and between the various government bodies charged with developing and promoting the program. While I don't intend to go into this at length – as these institutional problems could themselves be the focus of a PhD – I think they say a lot about the effectiveness of the NGP's agricultural development initiatives, and the disparate points of view about these initiatives. One of the most eye-opening interviews I undertook during my field work was with the Provincial Agriculturalist. The Provincial Agriculturalist was recently appointed to head the Provincial Agricultural Office (PAO) by the governor, with the task of reforming that organisation and promulgating the GMA program. An excerpt from my field notes describes some of the problems she faces at Provincial Agricultural Officer:

Case Study 3: The Provincial Agriculturalist (PA)

The PA is from a private sector background and was appointed in 2001 to head the Provincial Agricultural Office (PAO); she took over from her predecessor when the previous governor Rene Relampagos lost out to the incumbent Governor Eric Aumentado. We began by discussing the role of the PAO in Bohol and its relationship to the DA and the LGUs. According to the PA, the PAO is under the direct control of the governor who allocates the budget, while the day to day running of the office and policy development rests with the PA. The PAO is not required to implement any DA programs but does so at the behest of the governor who apparently is a friend and supporter of the president. The DA provides incentives to municipal agricultural officers (who are employed by the LGUs) to implement their programs at the municipal level, these incentives include monthly allowances, they also provide funding to the PAO, so according to the PA she has no choice but to implement their programs. MAOs and technicians *at the provincial level provide monthly reports to the DA regarding the progress of programs they are working on. One of the priority programs of the DA at present is the GMA program, the aim of which is to increase food supply at the national level and to increase jobs. While this program is being implemented by the DA, the hybrid rice component was actually initiated by Secretary Lorenzo from the President's Office of the Million Jobs program. Hybrid rice (PSB 72-H) is being provided to farmers at 500 pesos per bag, this is after a p1200 subsidy from the DA and a p500 subsidy from the Provincial government.*

The PA expressed some concern about the way in which policies were developed by the DA; she said this took place with little consultation with provincial agricultural policy colleagues and, was in her opinion, at odds with the interests of farmers. She specifically mentioned the recently passed PVP legislation which she said 'is good for scientists and multinational corporations but not good for farmers'; she also thought the hybrid rice program was not attractive to farmers with limited capital, i.e. most of the farmers in Bohol. She said that at regional meetings policy is often dictated to the provinces and that she was not consulted about the PVP legislation which was negotiated at the congress level. The PA was of the opinion that the PVP legislation was passed as part of some conditions set down by the WTO.

At the provincial level the focus is on integrated farming systems and sustainable agriculture. The PA is of the view that when the WTO agreement is implemented in 2004 Bohol's farmers will not be able to compete at the international level, she thinks going organic would be a low capital alternative to 'chemical farming'. The PA provided me with details of her SO-UP program which is a plan to implement organic farming initiatives throughout Bohol; she is currently seeking funding for this Php17, 000,000 program. She admitted that there is a clear disjunction between the agricultural policies of the national government and those of her office. The PAO focuses on sustainable food production at the household level, while the DA focuses on increasing national food production. Her office wants to focus on low cost, sustainable ways to increase food security while the national government in concerned with increasing production through increased capital inputs. Despite this she is doing her best at wearing two hats, but would like to have some input into policy at the national level and clearly would like to implement her own Bohol specific programs without the hindrance of the DA.

Apparently there has been a history of conflict between the municipal and provincial agricultural officers and the national body. The MAOs are the frontline in the GMA program but are employed by the LGUs, apparently many Municipal Agricultural Officers are discontented with the DA because they are not recognised as department heads and therefore, in their opinions, are not paid a wage that truly reflects their status. This came to a head in 1999 when Municipal Agricultural Officers in Bohol stopped submitting reports to the DA. There is a hope amongst MAOs that the respective mayors will upgrade them to department heads, but this has not happened across the board. The governor has no power in this regard and can only lobby mayors to upgrade MAOs.

Commenting on her first year as the provincial agricultural officer The PA said that she was frustrated at the slow pace of change. Coming from the private sector she was disappointed by the excessive political interference and alliances that hinder her work, and the slack approach of her staff. She said that the agricultural sector in Bohol needs reform and that many things hinder this reform. She has updated the PAO's mission statement, goals and values, but has little luck on the ground. She estimates that the PAO could reduce its size from 97 to 50 and be more efficient than it is now; apparently the Civil Service Code protects slack employees. She *said that it is the practice here to hire people who are not agricultural technicians (e.g. commerce or education graduates) for technical jobs, in her opinion this is ridiculous, if she had her way she would only hire appropriately trained technicians. Apparently people are hired for political favours and these people are not always the best for the job.*

The PA's views are indicative of the disjunction that has underlined this entire chapter. As she says, she is wearing two hats; with one hat she is promoting costly, green revolution like high productivity packages, and with the other she is promoting low cost, low input organic alternatives. The political imperative lies with the former and she is forced to clandestinely raise funds for another. One is mainstream, the other covert. One technologically disempowers farmers, the other empowers them. One relies upon reductionist science, and has little focus on building institutional capacity, while the other is all about building local knowledge, and institutional development. The two agricultural development initiatives discussed above are vastly different epistemologically, technically and ecologically, and, as the forthcoming discussions will demonstrate, both have been suboptimally adopted by the resource poor farmers of Campagao. While both agendas fight for ideological supremacy, Campagao's farmers continue to lack the resources to fully exploit one or the other.

9. The post green revolution adaptations of Campagao's rice farmers

Having discussed the socio-economic and institutional forces that affect local rice production, the agricultural metamorphoses that have taken place locally, and the agricultural development programs that seek to influence the practices of local farmers, it is now time to focus on the actual post green revolution practices of Campagao's resource poor rice farmers themselves. As the aim of this thesis is to identify some of the necessary and sufficient conditions for sustainable agriculture amongst resource poor rice farmers, and as I hope to suggest possible ways to operationalise these conditions in chapters 10 and 11, it is important that my analysis be grounded in the actual seasonal practices adopted by farmers themselves.

This chapter will provide a detailed analysis of the agricultural management practices of the 51 rice farmers interviewed during my field work in 2002. It will include details of land tenure and physical farm characteristics, as well as discussions relating to the management of rice plant genetic material, and agronomic practices such as land preparation, fertilisation, pest control, and harvesting and post harvest strategies. I will conclude by introducing case studies that will describe the adaptations of four very different farmers. Included in these case studies will be an economic analysis of rice production, with particular reference to inputs and the cost saving devices employed by resource poor farmers; the role of the informal local credit market in rice production will also form part of this analysis, as will the role of agricultural and non-agricultural sources of income.

Before moving on to the empirical material, I think it is necessary to explain what I mean by 'post green revolution'. I think it safe to say that mainstream agricultural development in the Philippines now follows an evolutionary trajectory, as opposed to a revolutionary one. Morin *et al* (2002) argue that Filipino farmers have entered the post green revolution phase because there is no longer anything revolutionary about the technology and information used by them. They argue that green revolution technology is standard practice and that Filipino farmers are "aware of fertiliser responsiveness, yield differences, variability between varieties in drought and flood tolerance, and many of the other technologies, practices, and institutions that make modern varieties work" (Morin *et al*, 2002: 145). I would also suggest that, due to the spread of alternative agricultural development initiatives such as the CDBC program and MASIPAG, the post green revolution is also characterised by expanding opportunities and that there exists a tension between what could be considered mainstream green revolution technologies and more agroecologically informed alternatives.

9.1 Land tenure and physical farm characteristics

As chapters 6 and 7 highlighted, the land tenure situation in Campagao is complex and idiosyncratic. Affect-laden ties dominate despite land tenure laws, and multiple forms of land tenure exist alongside each other. The informal land tenure agreements that characterised the green revolution period continue to the present, particularly in rain fed areas, and as we will see, landowner and tenant behaviour toward each other is – as it always has been since the kinaraan – of vital importance. The following discussion will highlight the complexity of the contemporary land tenure situation in Campagao, as well as providing background information on farm size, land distribution and physical farm characteristics.

The majority of the 51 rice farmers I interviewed during the 2002 rice growing season grow rice to provide food for their family, and to meet social obligations, as opposed to growing rice as a cash crop. The subsistence focus of these farmers is a direct result of the small size and often-variable physical characteristics of their land holdings. Table 9.1 contains details of rice land area farmed, including size and distribution, and the average and median rice land areas.

Table 9.1: Land area, distribution, mean and median: Campagao farmers (Author's fieldwork, 2002)

Land area classes (hectares)	Distribution (n=51)
0.125 – 0.49	7
0.5-0.99	21
1-1.99	19
>2	3
0.91	**Mean**

As Table 9.1 demonstrates, 56% (29/51) of those surveyed farm less than one hectare of rice land; only three farmers (two of whom include the Barangay Captain and his father), farm more than two hectares of land. The land area classes in table 9.1 include the total rice land holdings of the 51 farmers interviewed, regardless of the rice land parcels farmed and their distribution. For the purposes of this thesis, a land parcel refers to an area of land subject to a distinct land tenure regime. A farmer may cultivate one or more land parcels. Each individual parcel of land may be comprised of one or more rice paddies, or plots, and each land parcel may also be subject to a different farm management regime. Of the 51 farmers interviewed, 27 farm one parcel of land, 14 farm two parcels, 9 farm three parcels, and 1 farms 4 parcels of land. In some instances these parcels may be dispersed throughout Campagao in different sitios.

Campagao's farmers prefer to farm high quality, contiguous parcels of land that are close to their place of residence; however, many farmers are forced to seize opportunities to expand their land area, as they arise, regardless of the location of those parcels within the barangay. Just as one land parcel may differ from another, so too may the paddies or plots located within each parcel differ in both soil characteristics and water access. Furthermore, it may not necessarily be the case that paddies within land parcels are contiguous; however, this is generally the case.

While the average size of the land holdings of those surveyed is low, a more accurate picture of the marginality of these farmers is given if one assesses the distribution of rain fed and irrigated areas. Table 9.2 presents information on the distribution of rain fed and irrigated rice plots amongst those surveyed.

Table 9.2 The distribution of rain fed and irrigated rice plots, 51 Campagao farmers, 2002 (Author's fieldwork, 2002).

	Rain fed	**Irrigated**
Total area (ha)	13.9	31.5
No. of plots	30	56

In the above table, 'irrigated' refers to those areas that are serviced by irrigation systems that divert water from relatively permanent water sources such as upwelling springs, the Bilar River or its tributaries. At the onset of rains, and in most cases, regardless of rain, these farmers can irrigate their fields (and drain them), as need requires. 'Rain fed' (see plate 9.1) includes those paddies that are not serviced by permanent irrigation systems, although ephemeral canals are often made to divert water into rice paddies. These paddies also have no efficient drainage systems, which mean they can also be prone to flooding.

Further differences between irrigated and rain fed areas exist in relation to membership of kanaways, and the type of land tenure system that covers a particular land parcel. Those who farm paddies in rain fed areas are typically not members of a kanaway for that area, as no permanent irrigation channels that require maintenance exist. In many cases these farmers are also sharecroppers and are subject to the tinulo system of land tenure – as chapter 6 discussed, this is regardless of whether or not they are legally recognised as leaseholders under the agrarian reform law. For the rain fed farmer, tinulo is what works in practice. Conversely, irrigated farmers are members of kanaways, and are, in the vast majority of cases, legal leaseholders or owners. As Table 9.2 demonstrates, 30% of the land cultivated by those surveyed is rain fed land. Although rain fed land is 30% of the total area farmed, 25 of the 51 farmers I interviewed cultivate rain fed land, and 15 of those do so exclusively.

Plate 9.1: A typical rain fed area in sitio Ilaud, Campagao

Just as farmers may cultivate one or more parcels of land, so may they be subject to one or more (indeed up to three) modes of land tenure. As mentioned in chapter 6, farmers may own land, they may be leaseholders, or they may be share tenants (tinulo). In a limited number of cases, farmers may also have mortgage rights over the use of a land parcel, or be excluded from cultivating land due to an outstanding debt, which in both cases is referred to as prenda. In the Philippines, prenda refers most typically to the pawning of goods. In the case of rice farming in Campagao, prenda refers to the forfeiting of one's right to harvest, or to receive a share of the harvest (as an owner) until one's monetary obligations have been met. It is applicable to owners, leaseholders and sharecroppers. Table 9.3 includes details of the systems of land tenure governing the use of land by the 51 farmers surveyed.

Table 9.3 Land tenure matrix, Campagao farmers, 2002 (n=51) (Author's fieldwork, 2002)

Mode of land tenure	Ownership	Leasehold	Tinulo
Ownership	**10**	4	1
Leasehold	4	**12**	9
Tinulo	1	9	**15**

As the above matrix demonstrates, the vast majority of the farmers interviewed (n=37) are subject to one type of land tenure system and 14 are subject to two types; no farmer is subject to three. The most common mode of land tenure is leasehold (n=26), followed by tinulo (n=24), and lastly ownership (n=15). The most uncommon mixed tenure system is ownership and tinulo. In relation to land area and land tenure, farmers who have mixed land tenure systems cultivate the largest land areas. Indeed the three largest landholders interviewed, own and lease, or own and sharecrop, their landholdings. Some of the smallest land holdings are cultivated under the tinulo system. For example, four of the smallest seven land holdings (each between 0.125 and 0.25 hectares) are cultivated under the tinulo system. As we have seen, this is an extra-legal agreement based on goodwill between landlord and tenant.

The diversity and often affect-laden nature of land tenure and landlord-tenant relations in the barangay can best be presented using case studies. The following three examples provide in-depth descriptions of three farmers whose land tenure situations differ greatly.

Case Study 4: The Sanchez family

Cenio and Hilda Sanchez are a young couple who live with their three children in sitio Mateno Dos. Their primary source of income is rice farming. Other sources of income include hubble-hubble driving (using a motorbike to transport goods and people), and the proceeds from a small sari-sari store. Shortly after their marriage, Cenio was given two parcels of land by his parents, Elpedio and Celia. Elpedio, who has been a long-term tenant of the Macinte family – a large landowning family from Poblacion – had farmed these lands for over 30 years. Cenio calls the areas given to him by his parents: 'Kapurba' and 'Nabahag'. Kapurba (see plate 9.2) is a well-irrigated, productive area that is subject to a leasehold agreement between the Macintes and Elpedio, for which six cavans must be paid each and every season; it is approximately 0.4 hectares in size. Nabahag is a rain fed area of 0.25 hectares. Despite this, and in contradistinction to all other rain fed areas I researched, the area is also leasehold land; therefore two cavans must (legally) be paid upon each harvest. However, there is an agreement between the Sanchez and Macinte families that the rent for this area has only to be paid if Cenio is actually able to harvest the area. Payment can be delayed until such a time. However, since Cenio has farmed that area he has always been able to get a reasonable harvest. Indeed, due to the superior soil in that area Cenio classifies it as his most productive despite its lack of permanent irrigation.

Shortly after their marriage, Cenio and Hilda were also given another parcel of land owned jointly by the Anda and Hanas Families (close relatives of Hilda). This rain fed area (called 'Kuwari') is approximately 0.25 hectares and is broken up into three plots, two of which are owned by the Andas, and one of which is owned by the Hanas'. The tinulo system is used in these areas. Recently however, the Hanas family approached their close relatives, the Sanchez family, for a loan, and offered to forego their ownership rights for a period of time until the loan is repaid (prenda). As such, Cenio now effectively owns a portion of his 'Kuwari' area, while still paying his share to the Andas, and leasing land from the Macintes. Due to these numerous personal agreements, Cenio is at once a leaseholder (although of a modified nature), a temporary owner (through prenda), and a sharecropper under the tinulo system.

Plate 9.2 The Sanchez Kapurba area is fed by a canal on the left of the picture

Case Study 5: The Tejada Family

Compared to the Sanchez family, the Tejadas have a very simple land tenure situation, in what is a much more erratic rice-growing environment. Joey and Miriam Tejada, along with three of their seven children, and their young nephew, live in the most remote part of Campagao – sitio Ilaud. They have a very diverse income base and rely a lot upon remittances from their older children; animal husbandry and fruit, vegetable and lumber production are also important sources of income for them. The Tejadas grow the majority of the food that they consume. After their marriage in 1970, Joey and Miriam where given 0.25 hectares of rice land (in 7 parcels), and approximately 0.75 hectares of other land for use in corn, vegetable and lumber production. This land is part of a 7-hectare plot that has been farmed by Miriam's family for some time. The Balandra family from the coastal town of Lila own the land in question.

The rice/corn land has always been subject to the tinulo system of land tenure, and the land used for vegetable and lumber production is used free of rent. The Tejadas rice land parcels are located in a narrow valley, through which runs a tributary of the Bilar River; this area is very prone to flooding. As opposed to the Sanchez family who have experienced many years of relatively stable harvests, the rice harvests of the Tejadas has fluctuated widely, in fact between 1987 and 1991 (i.e. 7 seasons), no rice was harvested in the majority of the Tejadas rice area. This was primarily due to erratic climatic conditions. Cycles of drought followed by intense rain events disrupted the rice growing cycle. During these periods the Tejadas relied a lot upon root crops such as camote, cassava and taro. Due to the relative flexibility of the tinulo system, the Tejadas were much better off economically than if they held leasehold tenure over their land, which as we have seen would have required them to pay a fixed number of cavans of either rice or corn every season regardless of yield.

Case Study 6: The Dapar Family

Julio Dapar lives with his second wife Gandelaria and their three children in sitio Centre 2, very close to the national highway. Julio has seven other children from his previous marriage. One of whom works as a seaman in Europe and Japan. Julio owns his house, his one-hectare of irrigated rice land, and his 0.25 hectares of mixed cropping land – which is planted primarily to coconuts. Julio moved to Campagao from the neighbouring barangay of Dagahoy (where he had been the Barangay captain) in 1971. Julio is one of the most respected older residents of Campagao, and is the leader of the barangay's largest Dayong – Julio's Dayong, which is comprised of 70 families. Julio's land is well irrigated, and his yields are relatively stable, particularly compared to the Tejadas. He is close to a good source of relatively permanent water, and due to his interest in adopting modern agricultural techniques he has been using green revolution methods for many years now. Julio produces more rice than his family can consume in one year, and often sells his surplus to pay for improvements to his house, or for his children's education; remittances from his children also help him meet household costs.

The above discussions paint a picture of the diverse nature of land tenure within Campagao. It is clear that some Campagao farmers are able to manipulate their land tenure arrangements into configurations that benefit them, and suit their particular rice ecosystems. Having said that, the vast majority have no ownership rights over their lands, and while the affect-laden ties discussed above are relatively strong – particularly among relations – those farmers who have negotiated informal tinulo land tenure arrangements have no legal recourse should these informal arrangements be rescinded; moreover, those who have not signed leases over their lands have no legal recourse should they be evicted.

While these limited case studies do not emphasise it, there is evidence that land concentrations within the barangay are quite high. For example, despite the limit of seven hectares under the CARP, there are numerous (extended) families from Poblacion, who own much more than seven hectares of rice and/or corn land in Bilar. This land has been partitioned amongst extended family members in order to avoid the regulations under the CARP, and despite over 29 years since the passing of P.D 27, very little land has been redistributed to tenants in Bilar (see chapter 6). Of the 51 farmers surveyed, nine leased lands from the members of one extended family from Poblacion, and this land area covered much more than the legal seven-hectare limit.

9.2 The management of rice plant genetic material

Between June and October 2002 (panuig season), I documented the use of rice plant genetic resources by the 51 surveyed farmers from Campagao, 26 of whom are participants in the CDBC project (CFPRA farmers), and 25 who are not. During that period, the Campagao farmers planted 33 different varieties of rice in production; 25 of those varieties were FVs, six were MVs and two were TVs. Table 9.4 lists the eight most popular varieties planted by the farmers surveyed, the frequency of planting, as well as the percentage of land area planted to each variety (i.e. as a percentage of the total land area planted to rice by the 51 farmers interviewed).

Table 9.4: 8 most popular rice varieties, frequency and % of land area planted in Campagao, 2002 (n=51) (Author's fieldwork, 2002)

Variety	Frequency (n=51)	% Total land area
Vietnam	25	29
IR66	11	10
Pilit (puwa/puti)	10	1.7
CS1	6	7
MB	6	5.3
RC82	5	7
Japan Red	5	5.1
RC18	3	12.5
		77.6

As Table 9.4 demonstrates, these eight varieties comprise nearly 80% of the land area planted during the 2002 panuig season. By far the most popular variety used during panuig 2002 was the variety known locally as Vietnam. A SEARICE Coordinator introduced this variety to Campagao after a trip to Vietnam in 1998. The original 100 grams of seed was given to one CFPRA farmer to trial, and the variety became so popular that demand for it soon outstripped supply. The farmers prefer this variety due to its early maturation (85 - 90 days from sowing), palatability, its adaptability to varying landscapes, and also its response to minimal amounts of fertiliser. During panuig 2002, 18.66 tonnes of Vietnam was produced by the 25 farmers who grew the variety. For some farmers, Vietnam has surpassed IR66 as the most preferred variety; many of the farmers I interviewed had already planted the variety for three seasons in a row, and were looking for another variety to plant in panolilang 2002, before planting Vietnam again in 2003.

IR66 continues to be a popular variety and is described by many farmers as the best variety available in Campagao. Pilit varieties also remain popular due to their use in local sweet delicacies; however, despite their popularity, they only occupy a small land area. The CS1 variety is being planted in production by CFPRA farmers who want to exploit its pest and disease resistance and its response to organic inputs. While the use of MVs such as PSBRC18 and PSBRC82 has been quite poor despite the government's subsidisation scheme, and the volume with which it is being planted by some of the larger landowners in Bilar – in 2002, 150 cavans of PSBRC 18 and PSBRC82 were distributed to Bilar's farmers, enough to plant 14% of Bilar's rice area.

In Campagao, the lack of local uptake of these varieties is partly due to the perception that RC82 is a sickly variety that is susceptible to a wide array of pest and diseases, and is not tolerant of drought conditions; and the fact that RC18 matures later than many other varieties – which has led it to being referred to locally as ala 18, 'ala' is a local term for late. As Table 8.4 suggests, these varieties are being mostly planted by larger landholders, for example one farmer (the largest landowner in the barangay) planted 4 hectares of RC18. Other varieties such as MB and Japan Red – both red seed coated varieties – are becoming increasingly popular due to their palatability, drought tolerance, and early maturation.

During the panuig 2002 season, varietal diversity was much higher amongst the 26 CFPRA members (26 varieties), compared to the 25 non-CFPRA farmers interviewed (14 varieties). The number of varieties planted by each farmer also varied greatly, with CFPRA farmers more likely to plant multiple varieties: see Table 9.5. This was the case regardless of the number of land parcels farmed. For example, the average number of varieties planted per land parcel (infraspecific diversity) was 1.35 for CFPRA farmers and 0.82 for non-CFPRA farmers.

Table 9.5: No. of varieties planted per farmer (CFPRA/non-CFPRA/total) (Author's fieldwork, 2002)

No. of varieties planted	CFPRA	Non-CFPRA	Total
1	8	13	21
2	6	11	17
3	8	0	8
4	3	1	4
5 or greater	1	0	1
	26	**25**	**51**

In relation to the varietal classes planted by Campagao's farmers in panuig 2002, FVs continue to be the most popular. Eighteen of the FVs planted during panuig 2002 were from non-local sources and seven were farmer selections or breeds developed by CFPRA farmers. Of the 51 farmers surveyed, 41 planted at least one FV, seven planted at least one farmer bred variety, 10 planted at least one TV, and 17 planted MVs.

During panuig 2002, 18 farmers (all members of CFPRA) conducted trials with 27 different varieties of rice. Of the 27 varieties planted, 24 were FVs and 11 of these were varieties locally bred by either Cenio Sanchez or Radix Calamba, a farmer from the neighbouring barangay of Cansumbol who is also involved in the CDBC project. Only four local selections were planted for trial, and only two farmers planted these.

The trials conducted by CFPRA farmers seem to be of two types: firstly there are those farmers like Cenio, who are developing new varieties, and who use panicle and mass selection techniques to stabilise these selections; these trials are usually long term as it takes quite a few seasons to build up the necessary seed supply for production level planting (i.e. one cavan per hectare). Secondly, there are those farmers who acquire small amounts of seeds from varieties they have observed, and plant those in their paddies to assess the adaptability of that variety to their paddy environment; these are usually much shorter term trials and do not necessarily lead to an increase in diversity. The former, larger scale trials are particularly important for increasing rice plant genetic diversity and thus the choices available to farmers; however, these trials are substantially more demanding of time and resources, and are therefore usually undertaken by farmers with a keen interest in varietal development who also have sufficient land and water resources, i.e. land area, and good drainage control to avoid the washing out of trial plots.

9.2.1 Seed acquisition and supply

Like the green revolution and the kinaraan period before it, balo-balo remains the most important mode of seed supply for the surveyed farmers. Table 9.6 summarises the methods of seed supply adopted by the interviewed farmers for the panuig 2002 season.

Table 9.6: Methods of seed supply, *panuig* 2002 (Author's fieldwork, 2002)

Method of seed supply	Frequency
Balo-Balo (exchange)	39
Purchase from MAO	7
From own trials	5
Pito-Pito	5

As table 9.6 demonstrates, the majority of farmers used the balo-balo system to acquire the seeds they planted in panuig 2002. Farmers exchanged seeds with relatives and friends from the local area, other parts of Bohol, and even in other provinces such as

Mindanao. Farmers seem to take any opportunity they can to exchange seeds with their friends and relatives when they observe a good variety. However, problems do arise, especially if a farmer is late to ask another farmer to exchange, or if one's seedbed is washed away, or seedlings destroyed by pests such as the Golden Kuhol snail. When this occurs, farmers are often forced to rely on any seeds that are available at the time, and these seeds may not be suited to a particular paddy environment.

Two farmers who are particularly important to the seed supply system in Campagao are Cenio Sanchez, who has developed the CS and Red Japan varieties, and Felicio Omac, who was the first farmer to trial the very popular Vietnam variety. Both these farmers are active members of CFPRA. Cenio and Felicio participated in 30% of all the exchanges that took place before the 2002 panuig season. Apart from supplying their immediate relatives with high quality seeds, as many farmers do, these men were responsible for a significant number of exchanges with non-relatives, and also participated in exchanges with many non-CFPRA farmers.

The purchase of seeds from the MAO continues to be a method of supply favoured by those farmers with larger farms, and relatively large, and in many cases, non-agricultural sources of income. The two main government-subsidised varieties PSBRC18 and PSBRC82 sell for 350 pesos per cavan, while the government subsidised hybrid variety, which was planted by only one farmer in 2002, sells for 1500 pesos per cavan; as the economic analysis below will demonstrate this cost is too high for the majority of Campagao's resource poor farmers. However there is evidence that a very small number of farmers are getting access to new government subsidised seed through relatives within the Department of Agriculture, at greatly reduced prices.

Pito-pito was a source of seed supply for those farmers who also laboured in others' paddies, but as many pito-pito labourers are landless, they tend to sell or consume the fruits of their labour. Only five farmers planted varieties straight from the previous season's trials, all but one of these were off type selections or locally bred varieties.

Not unlike the green revolution and kinaraan periods before it, the panuig 2002 season was characterised by a disproportionate reliance upon a few varieties of rice, the most important of which was the variety Vietnam. The utilization of FVs remains a dominant theme, and the contribution of locally developed varieties is also increasingly important; while the use of government-sponsored varieties is skewed towards those farmers with larger (irrigated) land holdings. On average, farmers tended to plant one variety per land parcel; however, the inter and intra specific diversity of plantings was higher for farmers engaged in the CDBC program (CFPRA farmers) than those that are not. The balo-balo system remains the most popular mode of seed supply, and some farmers play a particularly important role in this regard.

9.3 Agronomic practices during the *panuig* 2002 season

This section will document the agronomic practices witnessed during the panuig 2002 season. It will provide detailed descriptive information on methods of land preparation, transplanting, fertilisation, pest and disease management, and harvesting and post harvest strategies. This information is vital to understanding how individual farmers adapt their agronomic practices to fit the economic and ecological realities of life as resource poor rice farmers. This section will highlight the labour and cost saving measures employed by resource poor farmers in particular.

In Campagao, the 2002 panuig rice planting season began in earnest after the intense rains of June 12, which were followed by several weeks of steady rain up until the end of July. It was during this period that the vast majority of the surveyed farmers prepared their rice paddies, and transplanted their rice seedlings (see table 9.7). Between mid June and mid July, the Philippines was affected by several tropical cyclones that caused major flooding in the north of the country; these cyclones, and the low pressure systems that followed, provided plenty of rainfall in Bilar.

Table 9.7: Frequency of planting and harvesting for 69 land parcels during panuig 2002 (Author's fieldwork, 2002)

	April	May	June	July	August	Sep	Oct	Nov	Dec
Transplanting	2	2	28	28	9	1			
Harvesting				2	2	25	30	9	1

As table 9.7 indicates, the vast majority (80%) of plantings occurred in the months of June and July, this includes both irrigated and rain fed areas. Those with well-irrigated land parcels tended to plant a few weeks earlier than those without. This occurred because those with rain fed paddies were unable to begin preparing their rice paddies until the rains began in earnest in mid June, as there was not enough water present in these paddies to facilitate the land preparation and seed raising process. The areas planted in April (usually a very dry month in Bilar), were very well irrigated areas and the farmers in question were attempting triple croppings for the 2001 - 2002 season, which is very rare within the barangay; the areas planted in May were also well irrigated (and includes an area that has Campagao's only formally registered irrigation works). The members of Iloy's kanaway – who were introduced in chapter 7, and who farm in a very remote part of sitio Ilaud – did not transplant their rice until August (as they usually do every year), because of the large amount of labour involved in fixing and maintaining the very long canal that feeds their area.

9.3.1 Land preparation

As with the kinaraan and green revolution periods, the contemporary rice production cycle begins with paddy dyke construction (timbao), and paddy cleaning or brushing (hagbas). This task is usually undertaken by paid day labourers at a cost of 100 pesos per day, although the system of pakyao or contract labour is being used by a minority of larger landholders; and in two instances labourers from outside the barangay were employed for this purpose. Those with very small landholdings (<0.5ha) tend to utilise family labour for these tasks in order to save money for the more expensive task of land cultivation, and ajon-ajon was not used by any of the farmers I interviewed for these tasks in 2002. Depending on the state of one's dyke walls, timbao may not be a necessity every season, and this task may be relatively minor; however hagbas is a task that is required each and every season, and depending on the width of the paddy dykes and the type of vegetation present, this can be very time consuming. According to the majority of the farmers I interviewed, hagbas is an important aspect of the rat control strategies employed by Campagao's farmers.

In relation to methods of land cultivation, the use of the hand tractor for ploughing and harrowing has increased in popularity since its introduction in the 1980s. However, as with the green revolution period, the carabao is still used for the levelling of the paddy fields after the final harrowing (see plate 9.3).

Plate 9.3: Levelling *(kahig)* a rice paddy.

Table 9.8 provides information on the frequency of hand tractor and carabao use for ploughing and harrowing amongst the surveyed farmers.

Table 9.8 Mode of land cultivation and frequency (n=51)(Author's fieldwork, 2002)

Mode	Frequency
Hand tractor (all parcels)	31
Carabao (all parcels)	12
Mixed	8

Many of the farmers I spoke with preferred the hand tractor primarily because of its speed, and its relative affordability even when compared to carabao labour. For example, a hand tractor operator can plough and harrow one hectare in between 12 and 16 hours depending on the physical characteristics of the rice paddies in question. If one adds to this the cost of levelling using a carabao, the average cost of land preparation per hectare for the farmers interviewed was 1600 pesos. In contrast, carabao and labourer take between five and seven days to completely plough, harrow and level one hectare of rice paddy, at a daily rate of 200 pesos – a range of between 1000 and 1400 pesos per hectare. Significant savings in land cultivation can, and were, made by those farmers who used their own labour for the process of land cultivation.

Of the 12 farmers who used carabao labour exclusively for land cultivation, eight owned their own carabao and four (all very small landholders: <0.5 ha) hired carabao labour. While 24 of the 51 farmers interviewed own carabaos, only ten of those used their own carabao to plough and harrow at least one of their land parcels, whereas they all used their own carabaos for levelling. The intensive labour investment associated with carabao use, particularly in larger landholdings, has influenced the decline of carabao labour. Many carabao owners prefer to use their animals in the levelling process, to save hiring costs, and to hire out their own labour to level other farmer's fields (a much less laborious task than ploughing and harrowing).

There are other issues aside from cost and labour intensity associated with land cultivation decisions. For example, at the beginning of the rice growing season, hand tractors follow distinct geographical routes through the rice growing valleys of Campagao, beginning in the denser rice growing areas close to the national highway before moving up into the more remote places like sitio Ilaud. Engaging a hand tractor is a relatively opportunistic and informal process, wherein the hand tractor operator will ask a farmer whose property borders one that is already being ploughed if a hand tractor is required; this process continues until all the paddies in a certain area have been ploughed and harrowed. If one happens to miss out on securing a hand tractor it is very difficult to get the operator to 'back track', and thus farmers will usually have to wait until their area is finished, or engage a carabao. Those farmers who live in more remote areas must simply wait until the hand tractor makes it to their sitio. This geographical and opportunistic method of land cultivation is just one of the mechanisms (a desire to avoid late season pest attack is another) that encourages synchronicity of plantings.

The decision to employ a certain mode of land cultivation is also influenced by the physical characteristics of the rice paddies in question, and by the preference of individual farmers. As Campagao is a karst area, many rice paddies contain limestone outcrops that severely impede the progress of hand tractors; and there are other areas with very stony soils (basbason) that also cannot be cultivated by hand tractors. During my interviews there were also a few instances of farmers who preferred cultivating land with carabaos because of the increased depth achievable using that form of cultivation; this was thought to encourage the deep penetration of plant roots, and therefore the uptake of nutrients from deep soil layers. These farmers expressed a concern with the shallow ploughing of hand tractors, particularly in deeper soils.

9.3.2 *Transplanting*

As with the green revolution and the kinaraan period before it, the transplanting of rice seedlings remains the most labour intensive process of the rice production cycle, and as such, provides the resource poor farmer with the greatest cost saving opportunities, through the use of family and ajon-ajon labour. The following section will examine the transplanting strategies employed by the 51 surveyed farmers.

The seedling raising and seed bed preparation witnessed during the panuig 2002 season remains the same as that practised during the green revolution and kinaraan periods. Seeds are pregerminated for 24 hours, dried in the dark, and then broadcast in a seedbed; the labour required for these tasks is largely supplied by the farming family, except in the cases of a few large landholders who employ labourers for this purpose. Seedlings are pulled and transplanted after approximately three weeks. During the panuig 2002 season the average number of persons required to pull and transplant one hectare of rice paddy was 19 (6.5 for pulling, and 12.5 transplanting). With over 140 hectares of rice land in Campagao alone (which would require 2660 days to transplant), this clearly provides a vital source of income to Campagao's landless labourers and resource poor farmers.

Table 9.9 details the transplanting strategies employed by the 51 farmers. As with the green revolution period, the employment of day labourers remains the most important source of labour, although ajon-ajon and family labour continue to be important labour sources.

Table 9.9 Transplanting strategies of Campagao's farmers (n=51) (Author's fieldwork, 2002)

Transplanting strategy	**Count**
Day Labour (all labour)	35
Mixed (day labour and *ajon-ajon*)	9
Mixed - no cost (*ajon-ajon* and family labour)	7

In the 'day labour' cases the provision of family labour was very limited and usually restricted to one or two persons, the vast majority of labour being carried out by teams of professional transplanters. Engaging day labourers is another affect-laden aspect of rice farming in the barangay; farmers tend to employ people whom they trust, such as relatives and close friends, and particularly those that have a demonstrated trustworthiness and a capacity to finish the transplanting task in one day. Indeed, regardless of the size of the land area to be planted, all farmers aim to finish the entire transplanting process in one day, and will hire the number of people needed to achieve this.

The close working relationship experienced between the vast majority of labourers and farmers, and the fact that many are both farmers and labourers, has produced a relationship that is largely non prescriptive in nature. For example, in the majority of cases, transplanters are left to assess things like rice planting density (i.e. spacing) and the seedlings planted per hill themselves. Campagao's transplanters use a system referred to as 'strike anywhere' (see plate 9.4), wherein seedlings are randomly placed. Transplanters move backwards at a quick even pace, being careful to cover their footprints, inserting 3 to 5 seedlings in each hill at approximately 25 centimetre spacings. The desire to work in a quick and regulated manner is reinforced by several stories I heard about transplanters who obstructed efforts by some farmers to implement the Margate system of transplanting, wherein only one or two seedlings are planted per hill at definite spacings, using a measuring instrument. Of all the farmers I interviewed, only one had managed to convince his transplanters to use the Margate system; others stopped trying to implement this system of planting once it became obvious transplanters where averse to it.

Plate 9.4: 'Strike anywhere' rice plant spacing; the severed rice stalks are a result of rat damage

The farmers who mixed day labour with ajon-ajon, or who relied upon ajon-ajon and family labour exclusively, tended to be small landholders with little expendable income. For example, the seven farmers who relied exclusively on family labour and ajon-ajon include the six smallest rice land holders I surveyed (with average landholdings of 0.4 hectares), four of these farmers cultivate land in rain fed or flood prone environments. The percentage of ajon-ajon as a total of all transplanting labour used ranged from 26% to 100% in the 16 cases. Clearly, then, ajon-ajon remains a very important labour source, particularly for small landholders.

The decision whether or not to use the ajon-ajon system rests upon several things. First and foremost, one must have a close, trusting relationship with an individual or a group of individuals who are also good transplanters. Obviously if the labour exchange between individuals is to be anywhere near equal, transplanters must be of a relatively similar skill level when it comes to transplanting. Having said that, I witnessed several instances whereby certain very skilful transplanters were particularly sought after for ajon-ajon; clearly, having a close friend who is a farmer and a skilful planter is very helpful. Another prerequisite for ajon-ajon relates to proximity with each other. For obvious reasons, farmers tend to seek ajon-ajon relationships with those fellow farmers whose rice paddies are contiguous, or very close to their own paddies.

Most of the farmers I spoke to who used ajon-ajon during the panuig 2002 season tend to use it each season. They usually make a decision about the amount of ajon-ajon labour to use in the three weeks before transplanting. Their decision is based upon three things: the cash available for paid day labour, the availability of ajon-ajon partners, and the availability of family labour to reciprocate the ajon-ajon labour employed. Those farmers with large families – particularly those with several older children still living at home – are obviously very partial to ajon-ajon labour, while those farmers with younger families tend to commit less time to ajon-ajon. In summary, these ajon-ajon relationships are, in many cases, long standing relationships, between people with similar financial and labour requirements, who exchange day labour in order to reduce the cash cost of transplanting.

In relation to the gendered division of labour, the contemporary rice-planting situation in Campagao follows the green revolution trend discussed in chapter 7, in favouring male day labour over female day labour. The vast majority of individuals undertaking day labour in rice paddies during the panuig 2002 season where males. The majority of these males are teenagers or young adults with little or no access to rice land of their own – day labour is in many cases their sole source of income. Older farmers tend to hire young relatives and their friends to undertake transplanting; farmers are very aware of the financial status of their close relatives and will do what they can, within their own means, to help their young relatives and close friends. An exception to the employment of young, often landless male labour clearly rests in the ajon-ajon system; here only farmers, or their immediate family work together. Many of the ajon-ajon exchanges I witnessed during the panuig 2002 season involved women, and were organised by women, some of whom had reputations as very skilled transplanters.

For the resource poor farmer, the activities associated with land cultivation and the transplanting of rice seedlings are the two most labour, and therefore cost intensive elements of the rice production process. As such, they also represent opportunities for significant savings in expenditure with the substitution of family or ajon-ajon labour for paid labour. Under trying financial circumstances, some farmers will work extremely hard during this time critical period in order to reduce costs. Below is a case study of a farming family who use ajon-ajon, family and day labour to meet the labour requirements of transplanting.

Case Study 6: The Hampac Family

Gloria and Ronaldo Hampac live with their five teenage children on the National Highway in the centre of Campagao. The Hampacs farm 0.8 hectares of rain fed rice land located adjacent to their house. The land in question is comprised of two parcels, one of 0.5 hectares which is owned by a former teacher from Campagao, the other parcel of 0.3 hectares, is owned by a aging local man who has no young family living in Campagao. The Hampacs pay both owners one-third of their net harvest and have not applied for agrarian reform in relation to both areas. They say they have a close trusting relationship with the landowners. The Hampacs produce rice mainly for consumption, and get extra income from Ronaldo's casual employment as a carpenter, and through farm labouring, particularly pito-pito.

In panuig 2002 the Hampacs planted two varieties: IR66 and RC82, both of which they sourced through their pito-pito labours. The Hampacs need 17 people to plant their 0.8 hectares: 12 people for transplanting and five for pulling. They transplanted both areas at the same time on July 10. Gloria Hampac is renowned as an expert transplanter, and she often engages in ajon-ajon with several of her female friends, her younger brother and Ronaldo's close relatives (see plate 9.5). During the panuig 2002 season the Hampacs entered into ajon-ajon arrangements equivalent to 10 days labour; three of her children also participated in the transplanting, meaning the Hampacs had to pay only 400 pesos to transplant 0.8 hectares of land. As such, through the use of ajon-ajon and family labour, the Hampacs were able to save 1300 pesos on the cost of transplanting. With five members of their family being expert pullers and transplanters, they each had to work two days to fulfil their ajon-ajon obligations.

Plate 9.5 Gloria Hampac and *ajon-ajon* friends transplanting

9.3.3 Fertilisation

The following discussion will highlight the fertilisation strategies employed by the 51 farmers interviewed during the 2002 panuig season. It will focus on the strategies employed by resource poor farmers in particular, but it will also contrast those strategies employed by farmers who produce rice as a cash crop, with those who produce rice mainly for consumption. The fertilisation strategies employed by the 51 surveyed farmers during the panuig 2002 season are detailed in Table 9.10 , which includes data for both CFPRA and non-CFPRA farmers.

Table 9.10: Fertilisation regimes for all land parcels (n=89) (Author's fieldwork, 2002)

Fertilisation regime	CFPRA (n=50)	Non CFPRA (n=39)	Total Count
Inorganic only	4	2	6
Inorganic/rice straw	27	32	59
Inorganic/rice straw/other organic	1	1	2
Rice straw	12	3	15
Rice straw/other organic	6	1	7

In the table above 'inorganic' refers to the use of chemical fertilisers. In Campagao, the most popular chemical fertiliser product is The Philippine Phosphate Fertilizer Corporation's (Philphos) 'Complete' fertiliser, which contains a 14:14:14 ratio of Nitrogen (N), Phosphorous (P), and Potassium (K). This fertilizer is available in the local Campagao store, and is also widely available in the market area in Poblacion. It is also widely marketed, with Philphos 'Complete' posters, adorning almost every roadside structure during the planting period. During panuig 2002, the Philphos Corporation also began to actively market their new 'Complete plus Sulphur' product, which is now also widely available throughout Bilar.

Philphos 'Complete' and Philphos 'Complete plus Sulphur' are usually applied between two and four weeks after transplanting. Prior to fertiliser application, water is drained off the rice paddies, and fertiliser is broadcast evenly throughout the paddies, a task that is usually undertaken by the cultivator. Farmers in rain fed or flood prone areas are particularly careful about fertiliser application and will postpone applications if the weather is too wet. Farmers in rain fed areas are also apprehensive if fertiliser application is followed by a long period of dry weather, which inhibits the dissolution of the fertiliser. Ideally, farmers hope for fine weather on the day of application followed by a few days of light rain.

During panuig 2002, 57 of the 67 inorganic plots were applied with Philphos 'Complete' or 'Complete plus Sulphur' only; the remaining nine plots were applied with Philphos 'Complete' and Urea. Application rates of Philphos 'Complete' varied from as little as 50 kilograms per hectare to 250 kilograms per hectare; the highest application rates achieved (300 kilograms per hectare) were for combinations of 'Complete', and Urea, at 200 kilograms and 100 kilograms per hectare respectively. The average application rate of Philphos 'Complete' fertiliser during the panuig 2002 season was 164 kilograms per hectare.

The use of inorganic fertiliser was, in all but six land parcels, accompanied by the application of decomposed rice straw. At the end of the panolilang season (around January–February), the rice straw left over from the threshing process is usually pushed into a heap and left to stand in the centre of the rice paddies from where it was collected. This rice straw is left to decompose up until the last harrowing of the panuig season, at which time it is broadcasted by the cultivator and incorporated into the soil. If the rice has not decomposed sufficiently farmers will let the rice straw stand for the duration of the panuig season and apply it during cultivation for the panolilang season. If intervals between harvesting in one season and cultivation in another are shortened because of late harvesting, farmers may broadcast the rice straw immediately after harvesting and submerge it in water to encourage its rapid decomposition before the next season. According to some farmers the decomposition rates of rice straw are also affected by the fertilisation regime the rice was subjected to in the previous season. Rice fertilised with organic materials only supposedly decomposes quicker than rice fertilised with inorganic fertiliser.

A number of other organic fertilisers where used during the panuig 2002 season including: carabao manure, pig manure, chicken dung, composted native grasses, madre de cacao leaves, ipil-ipil leaves, sea weed liquid fertiliser, and Bukasi, which is a compost made from locally available grasses and leaves inoculated with a mixture of Indigenous Micro-organisms (IMO). The number of farmers using these methods was however very low during the panuig 2002 season. As table 9.10 demonstrates, only nine of the 79 land parcels were fertilised with organic materials other than rice straw – and only seven of the 51 farmers surveyed used organic fertiliser other than rice straw. There are however quite a few farmers who have had experience with organic fertiliser – most commonly chicken dung. In all cases these are CFPRA farmers who have trialled chicken dung as part of the CDBC project. Of these, there are several farmers who applied rice straw only during panuig 2002 but who have applied significant qualities of chicken dung in previous seasons, and made the choice not to apply chicken dung during the season in question in order to save on input costs, and to exploit the fertility of their organic paddies.

Table 9.10 also details the modes of fertilisation used by both CFPRA and non-CFPRA farmers. As one would expect, considering the organic farming focus of the CDBC-CFPRA project, the number of parcels fertilised with organic material only is much higher amongst CFPRA farmers (36%) when compared to non-CFPRA farmers (10%). The popularity of rice straw as a sole source of organic fertiliser is one of the main reasons for this disparity; another is the use of chicken dung and other organic products by a small number of CFPRA farmers.

9.3.4 Pest and disease management

The following section will outline the pest and disease management techniques employed by Campagao's farmers, with particular reference to pesticide use and the cultural and mechanical methods of pest control employed during the panuig 2002 season. Included therein will be a case study of the Golden Kuhol, one of the most serious pests of rice plants in the barangay. To conclude, I will discuss the social importance of weeding, and the role of the bid system.

The use of insecticides to control pathogenic insects is very low amongst the farmers of Campagao. Of the 51 farmers interviewed, only seven used insecticides on at least one land parcel during the panuig 2002 season, and only three of those farmers could be considered regular users of insecticides, i.e. they use insecticides each and every season throughout the entire rice growing cycle. Of the three regular insecticide users, two could be identified as archetypal green revolution farmers, in that they have relatively large land holdings (the two largest landholdings of all those interviewed), they have well irrigated rice paddies, they apply significant volumes of inorganic fertiliser, and they use government sponsored modern varieties every season. The remaining four farmers used insecticides in response to outbreaks of pijanghaw, which were influenced by asynchronous planting schedules.

The most common insecticide used is 'Simbos', which is used to control pijanghaw infestations, and which is applied late in the season during the rice booting stage, which is the time at which pijanghaw attack the immature rice seedlings. The use of insecticides at other times during the rice cycle, e.g. in the seedbed, during pulling and during weeding, was restricted to the two aforementioned well resourced farmers, who applied the pesticides 'Karate' and 'Roldan' to control populations of case worm, armyworm and stem borer. The use of rodenticides was also very low – again only seven farmers used a rodenticide to control rats – as we will see the most popular forms of rat control are cultural and mechanical. The use of fungicides was restricted to one farmer who suffered from a neck rot infestation, which in his estimation was caused by planting a variety that was not suited to the very floody conditions experienced in his rice paddies.

The use of pesticides has no doubt been influenced by the Philippine Government's Kasakalikasan program, which introduced the concept of Integrated Pest Management (IPM) to the farmers of Campagao in 1995. Many of the farmers I interviewed participated in the season long IPM training undertaken by the MAO in 1995.

By far the most popular methods of pest control are cultural and mechanical methods. These diverse methods include: synchronous planting schedules, water management, the use of resistant varieties, varietal rotations, the use of repellent plants, biological methods of pest control, picking, trapping and cleaning – these methods of pest control, with examples of their application are outlined in Table 9.11; weeding which is a very important mechanical method will be discussed separately below.

Table 9.11: Cultural and mechanical methods of pest and disease control, Campagao 2002 (Author's fieldwork, 2002)

Method	Application
Synchronous planting	Synchronous planting is primarily used to deter *pijanghow* attack during the booting stage. The farmers explained that if paddies are planted at the same time, pest attack is distributed throughout the contiguous paddies, as all rice plants are at the same stage in the rice life cycle, whereas if one plants too early or too late, then a disproportionate level of pest attack occurs. The ability to plant in synchronicity is influenced by several factors such as the existence of institutions such as *ajon-ajon,* and the *kanaways;* by the timing of rainfall, and by the geographical opportunism associated with hand tractor use.
Water management	Water is drained off rice paddies for periods of between 3 days and 2 weeks in order to control populations of stem borer, case worm, whorl maggot, rats and golden kuhol. Clearly this technique is restricted to those farmers who have good drainage control over their rice paddies.
Resistant varieties	Farmers gravitate towards varieties that demonstrate good pest and disease resistance. Resistance to *pijanghaw* attack is a very sought after trait, as is resistance to *tungro,* and various other diseases that can have devastating effects on rice crops, such as rice blast and neck rot.
Varietal rotation	Farmers will not plant the same variety for more than three seasons in a row, and will seek new planting material each season using the *balo-balo* system. There was little evidence of crop rotation, as the vast majority of those farmers interviewed planted two crops of rice per year. Only one case of crop rotation was witnessed: a mung bean – rice–rice rotation.
Repellent plants	Repellent plants are used to ward off *pijanghaw,* and *tungro* attack, much the same way as they were used during the *kinaraan.* Some of these plants have been planted continuously since the *kinaraan* period; they include *ahito, amutan, madre de cacao, and tagbak.* However this is not a widespread systematic practice and is restricted to older farmers and members of CFPRA who have participated in the CDBC Ecological Pest Management field school.
Biological methods	Includes the use of ducks to control the Golden Kuhol snail, and the use of the Golden Kuhol snail to control weed growth in more mature rice paddies. It also includes the conscious decision not to alter predator/prey relationships within the rice paddy (through spraying insecticides), thus keeping pathogenic insect population level down. In some cases this extends to providing habitat for important predators.
Picking	Includes the picking of adult Golden Kuhol, and the picking of Golden Kuhol eggs.
Trapping	Farmers construct bamboo traps that can kill rats who are lured into the trap by baits; a common bait is young coconut, however rice is also used.
Cleaning	Farmers will clean the paddy dykes before land cultivation in order to deter rats, and so as not to provide habitat for pathogenic insects; they will also periodically clean paddy dykes during the rice growing season.

The importance of cultural and mechanical methods of pest control, their flexibility and their evolution is emphasised in the brief case study below, which looks at Campagao farmers' adaptation to the introduction of the Golden Kuhol.

Case Study 7: The Golden Kuhol

The Golden Kuhol or Golden Apple Snail (Pomacea canaliculata) was introduced into the Philippines in 1972 as a supplement to the Filipino diet, and in order to control rice paddy weeds. It has subsequently become one of the country's most serious pests within the rice paddy agroecosystem. According to Campagao's farmers, the Golden Kuhol was first introduced into Campagao in 1979. The Local Government Unit (LGU), and representatives from Boholano NGOs encouraged the farmers to cultivate the Kuhol. Unfortunately the Golden Kuhol is not very palatable and was disregarded by the locals as a source of food, and the Kuhol itself seemed to prefer the young fresh shoots of palay seedlings as opposed to rice paddy weeds. In the first few years Campagao's farmers were shocked by the amount of damage the Kuhol was causing, particularly in the first few weeks after transplanting. The Golden Kuhol outbreak seemed to have caught the MAO by surprise, and, at first, they suggested the use of molluscicides to control the snail. The majority of the farmers I spoke with did not consider this a viable option due the expense of the molluscicides, not to mention their sporadic availability; some also commented on the decreasing effectiveness of the chemical over time.

The farmers of Campagao set about devising a series of cultural and mechanical means of controlling the Kuhol, which have turned what was once a serious problem into a relatively minor one, at least as far as the farmers I interviewed were concerned. The majority of these methods were developed through observation – particularly by some of the barangay's more astute farmers - and they spread through social learning. The most important mode of control is water management; paddies are usually drained for between one and two weeks shortly after transplanting has taken place. This is accompanied both before and after draining by the picking of the Kuhol, which are then placed in bags and are either drowned or placed in the sun. The use of ducks to control Kuhol levels is also a popular method. Farmers may also screen rice paddy canals to inhibit entry of Kuhol into their paddies, and they may also use varieties that demonstrate a resistance to Kuhol attack. Aside from water management, the most ubiquitous adaptation is the broadcasting of extra seed in the seedbed; the vast majority of the farmers I spoke with now broadcast between 10% and 25% more seed into the seedbed than they would in the absence of the Kuhol. These extra seedlings are used to replace those destroyed by the Kuhol after the first one to three weeks after planting. After three weeks farmers become less vigilant with Kuhol control as the Kuhol moves on to other food sources. They do however continue to pick adult Kuhol and destroy the bright pink Kuhol eggs. After the initial damage is over some farmers leave the Kuhol within the rice paddy to feed upon young weed shoots.

A cultural and mechanical method of pest and disease control that is of significant importance in the barangay is weeding. Weeding is important not only for agronomic reasons (e.g. restricting competition with young growing rice plants); it also plays an important social role. Weeding provides the landless labourers and resource poor farmers of Campagao with an opportunity to secure a harvest under the bid system – as has previously been discussed it also provides another source of paid day labour. Of the 51 farmers interviewed during the panuig 2002 season, 17 undertook no weeding operations whatsoever, nine weeded their own fields, 14 utilised the bid system, and 11 paid day labourers to weed their paddies. Interestingly, many farmers consider weeding a waste of time and money; these farmers contend that there is no significant yield effect if one chooses to weed or not, and as such they see weeding as an opportunity to save on the costs of production. Some of these farmers suggest that weeding has become less necessary since the introduction of the hand tractor, which harrows much more finely than the carabao, which is thought to inhibit weed growth. Some of the farmers who did not weed could not because of a drying out of their rain fed rice paddies.

The use of the bid system during 2002 revolved, in many cases, around giving preferential access to relatives or friends who have no or very little land to cultivate themselves. For example, of the 14 farmers who used bid labour, 12 gave preference to either close relatives or friends. The remaining two farmers used labour from outside the barangay to perform this task. In all cases those who undertook the bid labour were the ones who harvested the rice paddies. Those who utilised bid labour included some of the highest yielding farmers interviewed (including the seven most productive areas), which emphasises the fact that bidding for productive areas is a common occurrence. However, by no means was bidding just utilised by well resourced farmers; a number of farmers who utilised the bid system are anything but well resourced, and many of the farmers I spoke to use the bidding process as a favour for their landless relatives.

9.3.5 *Harvest and post harvest strategies*

The harvest and post harvest situation in Campagao is relatively simple. For example all the farmers I interviewed (bar four) used the pito-pito system to harvest their rice crop; one remaining farmer was forced to negotiate a 50:50 split with his harvesters, as his land parcels were severely affected by a fungal disease; and three other farmers used family labour to harvest their small (and very unproductive) rice plots. Young landless labourers who typically have a close relationship with the cultivator undertook the vast majority of pito-pito labour – in many cases these pito-pito teams included the sons or daughters of the cultivator in question (i.e. sons and daughters who already have their own families, and no longer live at home). Only seven of the 51 farmers interviewed engaged in pito-pito themselves (in another farmer's field) during the panuig 2002 season.

Harvesting itself is usually preceded by the draining of the rice paddies for a period of between two and three weeks before the harvest. This was especially difficult during the panuig 2002 season as September was a very rainy month and flooding was quite common, particularly in those paddies that are contiguous to tributaries of the Bilar River. Thus many farmers harvested one or two weeks later than usual, and in a few cases severe damage to rice plants was caused by continuous flooding.

During the harvest pito-pito teams use a garab to separate the rice stalk from the base and place the rice in large haystacks before threshing, in much the same way as they did during the kinaraan. Pito-pito always includes the threshing and winnowing of the rice, and the cost of hiring a thresher and blower (a machine used for winnowing) is deducted from the gross harvest; harvesters then receive one seventh of this net harvest.

All of the farmers I interviewed, except two, used foot threshers to separate the unmilled rice from the stalk; the two remaining farmers used a mechanical thresher or Bulhot, which they owned – these machines are prohibitively expensive and are not used by the average Campagao farmer. Aside from those who used the Bulhot, which also winnows, most farmers used a pedal blower to winnow; three farmers used the traditional nigo – these were the same three farmers who harvested their own rice paddies.

Once the unmilled rice is harvested it is placed on mats in the sun for approximately eight hours to dry. Farmers will utilise almost any flat surface for this purpose, and shortly after the main harvesting season flat dry space is a rare commodity. The labour required for this task is usually undertaken by the farming family; however in some cases those farmers with relatively large harvests may employ someone to help them in this task. Only two of the farmers I interviewed used a solar dryer to dry their unmilled rice. Upon drying, rice is stored in large bags (usually old fertiliser bags), and milled as required. Farmers are careful to ensure that stored rice is kept off the ground, as rat damage is very common. Every farmer I spoke with used the local Toledo rice mill at a cost of one peso per kilo of unmilled rice. As well as being the sole miller in the barangay, the Toledos are also the barangays primary rice trader.

As table 9.1 indicated, the harvesting season began in earnest in September and continued on until late October, at which time the vast majority of farmers had harvested their rice paddies. The rice yields of the 50 farmers I obtained yield data from varied quite considerably – this information is presented in Table 9.12.

Table 9.12: Rice yield details, Campagao farmer's panuig 2002 (n=50) (Author's fieldwork, 2002)

	Average yield (tonnes per hectare)	**Standard deviation (tonnes per hectare)**	**Range (tonnes per hectare)**
Irrigated	2.08	0.66	1.0 – 3.6
Rain fed	1.54	0.56	0.5 – 2.7
All parcels	1.79	0.67	0.5 – 3.6

As table 9.12 demonstrates, those farmers with irrigated rice paddies produced higher yields than those without. However, as the standard deviation and range data suggest there was substantial yield variation within and between irrigated and rain fed land parcels. Clearly, the presence of well maintained and reliable irrigation systems makes a significant difference in base level rice yield. However, the reasons for the variance witnessed are complex and cannot simply be attributed to the presence or absence of irrigation systems, a complex array of factors affect yield potential. These include: the role of rice in one's livelihood strategy (cash crop/subsistence), fertiliser use, the choice of rice plant genetic material, one's pest management decisions, one's economic circumstances, and the labour constraints one faces. I will address some of these issues in the four case studies below.

Aside from producing the highest average yields, the irrigated areas also produced the only yields above three tonnes per hectare (6 of the 51 plots), and these yields were achieved by four very different farmers. Two of these farmers are the archetypal green revolution farmers I mentioned previously in this chapter – Ben Toledo, and his son Boy, the barangay captain, and the other two farmers are fully converted organic farmers from CFPRA: Carmelita Bucar, and Cenio Sanchez, the Treasurer and President of CFPRA respectively.

In relation to the rain fed land, four of the 30 plots yielded less than one tonne per hectare, which is, by all accounts, less than what was possible during the kinaraan period. One of these very low yields can be attributed to the neckrot infestation I mentioned in the preceding paragraphs, and three others can be attributed to drought stress experienced early in the planting season. The high rain fed yields (those over two tonnes per hectare) generally occurred in areas that have fertile soils as a result of having significant amounts of organic fertiliser applied in the past few seasons. Indeed all the high rain fed rice yields (n=7) occurred in land parcels fertilised with chicken dung as a part of the CDBC/CFPRA project.

9.3.6 *Four very different farming families*

The preceding paragraphs discussed the various rice farming adaptations adopted by Campagao's farmers during the panuig 2002 season. It also commented on some important social and cultural aspects of rice farming such as land tenure agreements, ajon-ajon, kanaways, and pito-pito. I now intend to discuss the socio-ecological adaptations of Campagao's farmers in a more holistic and contextual way through introducing four different rice farming families whom I have labelled: the migrant labourers, the tuba-gatherers, the green revolution farmers, and the organic innovators. These case studies reflect the heterogeneity of livelihood adaptations within the barangay.

Case Study 8: The migrant labourers

Macio (62) and Gertrudes Ampa (51), along with five of their 12 children live in a small nipa hut on the Dagahoy Rd in sitio Mateno Dos. The Ampas, who were originally from the neighbouring barangay of Dagahoy, moved to Campagao in 1991 to escape the escalation in violence between the New People's Army (NPA) and the Philippine Military. They were not alone in this, indeed quite a few families moved from Dagahoy to Campagao during the early 90's to escape the insurgency. The decision to move to Campagao was a relatively easy one as both Gertrudes and Macio have many close relatives in Campagao. Unfortunately, the Ampas had to give up their rice field (0.25ha) and their baow field when they left Dagahoy.

Shortly after moving to Campagao, the Ampas sought permission from the Dao family to build a small nipa hut adjacent to the Dao's land on the Dagahoy Rd. The nipa hut they live in is actually on barangay land, and the Ampas live there without any title whatsoever – the occupation of barangay land is an important land access strategy for some of Campagao's poorer farmers, particularly those who have migrated from other barangays. Access to agricultural land was, however, much harder to come by. It was not until 1999 that the Ampas were 'given' a small area of rice land (0.25ha) to farm by one of their neighbours. Their immediate neighbour, Leon Engig – also a migrant from Dagahoy – had access to three rice areas already, and 'gave' his tenancy rights over one parcel of land, owned by the Quilicot family, to the Ampas, as he could not farm all three areas at once, because he was quite often busy with his work as a truck driver. Leon had been a long-term tenant of the Quilicot's, even when he resided in Dagahoy, and suggested to them that they should accept the Ampas as tenants. In the year 2000, the Ampas also acquired access to a small portion of corn land from a neighbour of theirs – Pedro Jaum – whose land was lying idle due to his inability to cultivate it.

Aside from their rice and corn land the Ampas work as pito-pito labourers. This is by far their most important source of rice (and thus income). Each year the Ampa family, including Macio, Gertrudes and two of their sons may acquire up to 50 cavans (approximately 2000 kilograms) of unmilled rice through working as pito-pito labourers. Approximately half of this rice is used for consumption, and the other half is sold at approximately 10 pesos a kilogram to buy food and to pay for schooling expenses. Two of the Ampas children are currently in primary school and one is in high school, all of the Ampas other children left school before entering the secondary level (e.g. at 10-11 years of age). The expenses involved in education are quite high, and as children progress to high school these expenses escalate; unfortunately, over the years the Ampas have been unable to meet the costs of high school education, and thus most of their children have had to leave school at very young ages in order to work as labourers themselves.

The importance of education in the barangay is paramount; many of the farmers I spoke with receive remittances from their children who work either overseas, or in other provinces of the Philippines, and education is a prerequisite for employment in many areas. Thus not being able to contribute to the education of one's children undermines the ability of that child to acquire relatively high paying employment. Having said that, the Ampas do receive occasional remittances from their two daughters who work as domestic helpers in Tagbilaran City and Cebu; however the wages for this type of employment are very low. Aside from farm labouring and rice and corn farming, the Ampas also earn a small amount of money from copra production. Due to their lack of financial resources, and the irregularity of their income, the Ampas are very wary of accessing large amounts of credit, however they do participate in the ihaw-ihaw and abuno schemes of the local purok when their financial situation allows it.

In relation to rice production, the Ampas had a very poor harvest during the panuig 2002 season; indeed they experienced the lowest harvest of all of the farmers I interviewed – (0.5t/has) – or 3 cavans (120 kilograms) of unmilled rice. One of the reasons for this was a lack of water for an extended period of time shortly after transplanting. The area they farm has very poor access to water, and their position in the local catchment means they are often the last to access water. In order to reduce the costs of production Macio undertook the land cultivation himself – however, as he owns no carabao he had to hire one at a cost of 100 pesos per day. The transplanting of the rice seedlings was conducted using ajon-ajon labour with 3 of the Ampas children who also farm land in Campagao. And due to a lack of finances, the Ampas decided not *to apply inorganic fertiliser at all, and instead relied upon rice straw. The Ampas planted a locally developed FV called Japan Red – bred by their neighbour Cenio Sanchez – during the panuig 2002 season, which they acquired by harvesting Cenio's fields the season before. They preferred Japan Red because of it drought tolerance and palatability. The Ampas harvested their paddies themselves, and used a nigo to winnow the rice in order to reduce the post harvest costs. Table 9.13 below provides an economic assessment of rice production by the Ampa family during the panuig 2002 season.*

Table 9.13: Economics of rice production – Ampa family, *panuig* 2002 (Author's fieldwork, 2002)

Gross Yield (Y) (0.25 hectares)	0.120 tonnes of palay @ 10 pesos per kilo = 1200 pesos (0.47 t/has)
Inputs	*Costs (Pesos)*
Seed for transplanting	0 (*pito-pito*)
Paddy dyke preparation	0 (family labour)
Land preparation (Carabao for 2.5 days)	250
Transplanting and pulling labour	0 (*ajon-ajon*)
Fertilisation (rice straw)	0
Pest Control	0
Total Costs (T)	*250*
Pito-Pito (P)	*0*
Owners share (O)	*400*
Net Yield (Y-T-P-O)	**550 (0.055 tonnes palay)**
Input/Output ratio[1]	**0.45 pesos per kilo**

1. The Input/Output ratio is the sum of all the cash inputs in the entire rice production process, divided by the net rice produced in panuig 2002. It is the cost to the farmer for each kilogram of rice available for consumption or sale.

The economic assessment gives an indication of the cost saving mechanisms employed by the Ampas and other resource poor farmers, and allows for a comparison between different farming families. Such comparisons will highlight the heterogenous economic strategies employed by farmers with very different resource endowments. As the analysis above indicates, the Ampas use as much family labour as possible to offset production costs, in what they know to be a very unproductive area, and unfortunately their lack of resources, and their risk averse sensitivities preclude them from making this particular land parcel more productive.

Case Study 9: The tuba gatherers

Rupa Angeles (40) and her husband Erico (45) live with their two young children, Anna Fe and Zyrus, in a house close to the national highway in sitio Mateno Uno. Their house is surrounded by numerous coconut palms from which Erico extracts tuba – an alcoholic drink that he sells to a local merchant. This provides his family with a regular income of about 700 pesos per week, each and every week of the year. The Angeles also earn a small irregular income from raising chickens and pigs. Erico inherited the tenancy of his 0.5 hectare rice paddy in 1977 and has been farming that area ever since. Erico's father signed a land tenure agreement with the Macinte family many years ago, according to this agreement the Angeles must pay the Macintes 4.5 cavans every season. Erico's area is in a well-irrigated valley that is fed by a spring that emanates from the hilly mountain regions around Cansumbol, to the east of Campagao. Erico is a member of the local kanaway – as his father was – and the 21 members of that kanaway clean the irrigation canal on a regular basis, and use the ihaw-ihaw system to raise income for canal maintenance. The Angeles are also very active members of their local purok, which raises money *from ihaw-ihaw and abuno. Just before the May 2002 fiesta in Bilar, the Mateno Uno purok raised 1500 pesos from the sale of two pigs. This money was reinvested in the purok for further ihaw-ihaw schemes.*

Erico and Rupa have also been long-term members of CFPRA and have been active participants in the CDBC project. Since 1996 they have applied numerous bags of chicken dung to their rice paddy in order to increase the fertility of the land, something Erico noticed had been declining after almost 20 years if inorganic fertiliser use. The Angeles also have an interest in trialling new varieties and have participated in numerous varietal selection trials undertaken under the CDBC project. In panuig 2002, the Angeles planted the Vietnam variety, which they bartered from another CFPRA farmer. The Angeles' preferred this variety because of its early maturation, palatability, and the fact it grows well in the panuig season. In relation to the rice production cycle itself, Erico prepared the paddy dykes himself, and employed hand tractor labour to cultivate his rice paddies, however he was able to reduce the costs of land preparation slightly by undertaking the last harrowing and levelling himself using his own carabao.

The Angeles employed day labour for the pulling and transplanting of the rice seedlings (they use the same group of people every year for this task), and as they were not able to access chicken dung during the panuig 2002 season (a situation that will discussed at length in the next chapter), the Angeles decided to trial inorganic fertiliser again. And in doing so they applied one 50-kilogram bag of Philphos to two-thirds of their 0.5 hectares (according to Erico the other one-third was 'already fertile'). The Angeles' had to get credit to pay for this, and they simply added it to the credit they get every season to help with the land cultivation and transplanting costs. The Angeles obtain credit for land preparation from a local money lender who expects to be repaid 1 kilo of unmilled rice for every 6 pesos borrowed (after the harvest). As a kilogram of unmilled rice typically sells for 10 pesos per kilogram (during the harvesting season), the local moneylender is obviously doing very well. The fertiliser is repaid at a cost of 60 kilograms of unmilled rice per fertiliser bag (which usually sells for 430 pesos), again a very high rate of interest. Aside from Philphos, the Angeles also incorporated the rice straw from the panolilang 2001 harvest into their fields as they have done for many years.

The Angeles incurred no costs for pest and disease control, and used the bid system for weeding. Again, the same people weed (and therefore harvest) the Angeles rice paddies every season; these are usually four or five of Rupa's ten brothers. The Angeles had a relatively good year, with constant water access, and little damage from kuhol, rats or pijanghow. Rupa's brother's harvested the Angeles rice on the 17th September. In total, the Angeles' were able to harvest 35 cavans of Vietnam. Table 9.14 below provides an economic assessment of rice production by the Angeles during the panuig 2002 season.

Table 9.14: Economics of rice production – Angeles family, *panuig* 2002 (Author's fieldwork, 2002)

Gross Yield (0.5 hectares)	1.33 tonnes of palay @ 10 pesos per kilo = 13330 pesos (2.66 t/has)
Inputs	*Costs (pesos)*
Seed for transplanting	0 (*balo-balo*)
Paddy dyke preparation	0 (family labour)
Land preparation (hand tractor only)	600
Transplanting and pulling labour	1100
Fertilisation	420
Pest Control	0 (*bid system)*
Interest on 1200 pesos borrowed for land preparation and transplanting (22% per month)	700
Interest on fertiliser (14% per month)	170
Thresher/Blower hire	250
Total Costs (T)	6920
Pito-Pito (P)	1760
Owners Share	1710
Net Yield (Y-T-P-O)	**6370 (0.634 tonnes of palay)**
Input/Output ratio (Cost per kilo of net yield)	**1.08**

The economic assessment above is in sharp contrast to the case of the Ampas. Unlike the Ampas, the Angeles are regular users of substantial amounts of credit, and routinely use credit for land preparation in particular. This predilection towards credit is no doubt influenced by the relative stability of the Angeles' well-irrigated rice land, and by their regular income in comparison with the Ampas. Clearly, the net yield of the Angeles is affected dramatically by the very high interest rates charged by the local moneylender, as well as the high costs of hand tractor labour and transplanting. The various costs associated with rice production consume a little more than 50% of their gross harvest, as was also the case with the Ampa Family.

Case Study 10: The green revolution farmers

Boy Toledo (43) has been Campagao's barangay captain since 1997. He lives with his wife Carolina (40) and their two children on the national highway. Boy has a college degree, and his wife is currently completing her PhD in education at the University of Bohol. Boy's father, Jose, was also the barangay captain in the 1970's, and he now owns the local rice mill, while Carolina's mother is one of the area's most astute moneylenders. Aside from rice farming, the Toledos are also engaged in a trucking business, money lending, and politics, which provides Boy with a regular income as the barangay captain. Boy is also the President of the Association of Barangay Councils in Bilar, and is actively involved in municipal level politics. Between them, the Toledos own three hectares of farmland in the barangays of Cansumbol and Zamora upon which they grow Mahogany and Gemilina trees. Boy also has access to almost four hectares of rice land, none of which he owns. He acquired his first areas of rice land shortly after his marriage in 1976 – two areas were 'given' to him by his mother in law, the other by his father, he pays fixed rent each season for these areas. The tenancy rights to a third area were 'given' to him by his father in 2001. All of Boy's rice farming areas are well irrigated.

Boy has always had an interest in modern farming techniques. He has experimented with basal application and organic fertiliser, and always uses modern varieties released by the MAO. Boy *began using basal application in the late 1970s; while he was initially happy with the yields, these tended to decline over time (up to 50% in some areas according to Boy), he said that he noticed his soil characteristics change over time also. To arrest this soil fertility decline, Boy began applying chicken dung and rice husk (tahop) compost, which he got at no cost from his father's rice mill. When available, Boy applies the tahop in April (usually a dry month in Campagao), when large trucks can access his rice paddy. Boy is of the opinion that the alkaline soils of Bilar are not suited to continuous applications of inorganic fertiliser, and that is why he applies large amounts of organic material when it is available. Aside from fertilisation Boy has always applied pesticides in his areas, and is one of the very few farmers I interviewed who does this each season. Boy is also different from many other local farmers in that he has access to a mechanical threshing and blowing machine, which is owned by one of his brothers.*

In relation to the rice production cycle witnessed during panuig 2002, Boy was very different from the preceding farmers in that he used day labour for all aspects of the rice production cycle – he did not try to reduce input costs by undertaking any labour himself, or by engaging in ajon-ajon. Boy employed day labour to prepare his seed beds, he used the pakyao system for dyke preparation, he employed hand tractor labour for ploughing and harrowing, carabao labour for levelling, and contracted workers from another barangay to transplant his rice seedlings. Boy planted the RC17 variety in each of his three areas in early July; he obtained this variety from the MAO. He mentioned that his fields came under very little pest attack during the panuig 2002, and he was able to harvest in mid October. Boy used labourers from outside of Campagao to harvest his rice paddies – as he does every season. Table 9.15 includes an economic assessment of the four areas Boy farms.

Table 9.15: Economics of rice production – Toledo family, *panuig* 2002 (Author's fieldwork, 2002)

Gross Yield (Y) (3.75 hectares)	11.16 tonnes of palay @ 10 pesos per kilo = 111,160 pesos (3.09t/has)
Inputs	*Costs (pesos)*
Seed for transplanting	1300
Seed bed preparation	700
Paddy dyke preparation	2000
Land preparation (hand tractor and carabao)	7600
Transplanting and pulling labour	5500
Fertilisation	10770
Pest Control	700
Total Input Costs (T)	*29770*
Pito-Pito (P) (labour)	*15942*
Owners Share (O)	*13200*
Net Yield (Y-T-P-O)	**52,677 (5.26 tonnes of palay)**
Input/Output ratio (Cost per kilo of net yield)	**0.56**

Case Study 11: The Organic Innovators

Cenio (42) and Hilda (35) Sanchez were first introduced in case study 1 above, where I discussed the Sanchez family's complex land tenure arrangements. The Sanchez family farm 0.9 hectares of rice land in three areas, two of which are well irrigated. As the reader will already be *aware, Cenio is the president of CFPRA and is an active participant in the CDBC project. Cenio is also an accomplished rice breeder. Cenio was born and bred in Campagao, where he has farmed since he was a small boy, helping his father. Cenio's parents Elpedio and Celia are also rice farmers, as are seven of Cenio's 12 siblings, his remaining four siblings live in Manila. Four of Hilda's siblings also live in Campagao, while two have migrated to Mindanao to find work. The Sanchez family have three young children Leonel (12), Archie (9) and Isabella (5); Leonel and Archie are currently enrolled at Campagao elementary school.*

As neither of their parents could provide them with any residential land, Cenio and Hilda originally built a small nipa on barangay land close the residence of the Ampas and other families from Dagahoy who moved due to the insurgency. As the years have passed the Sanchez family have managed to renovate their small house, it is now much larger and is of concrete and iron construction, as opposed to wood, bamboo and nipa palm. Cenio and Hilda have worked hard over the years to renovate their house, and their participation in the CDBC project, and their adoption of organic farming in particular has contributed significantly to their economic well being – as the forthcoming economic assessment will attest. Cenio began converting his paddies to organic shortly after the CDBC project started in 1996. At first he applied small amounts of chicken dung to one area as a trial, he was happy with the results and then applied chicken dung to the entire area; he staggered the conversion of his paddies over a three year period from 1996 to 1999. Cenio was attracted to organic farming because he realised that the soil fertility of his paddies was declining rapidly, he had noticed a depletion of the soil structure, and a change in the colour of his soil. Prior to 1996 Cenio had used inorganic fertiliser like most of his fellow farmers, and he had used the basal method for a few seasons, while initially buoyed by the yields achieved using this method, he noticed that they tended to decrease quite dramatically over time. In order to restore his soil's fertility Cenio commenced a regular organic fertilisation regime that involved fertilising his areas with between 400 and 750 kilograms of chicken dung per hectare per season. He continued this until he thought his soil fertility had returned – this took five seasons. Cenio was able to access chicken dung through the CDBC project. Now instead of applying a certain amount of fertiliser every season, Cenio applies rice straw every season, and applies chicken dung when he feels the fertility level of the soil in any of his three areas is declining – this is something he gauges by observing the early vegetative growth of the rice plants, and by observing the soil characteristics themselves. During the panuig 2002 season Cenio applied no fertiliser other than rice straw to any of his areas; the last time he applied chicken dung was panolilang 2001 – to one area; his most fertile area had not been applied with chicken dung for 4 seasons (i.e. panuig 2000).

In relation to the rice production cycle, Cenio uses his own labour where he can to lower input costs, particularly in relation to paddy dyke preparation and maintenance, and seed bed preparation. He uses a hand tractor for the majority of land cultivation, except in one of his areas, which is very rocky, and he uses his own carabao for the last harrowing and levelling each season. He does not engage in ajon-ajon, but instead employs friends and relatives to transplant his rice for him at a cost of 70 pesos per day. He uses the bid system for weeding (the Ampa family mentioned above harvested his rice in panuig 2002); and he incurs no costs for pest and disease control, as he does not apply any pesticides, he uses water management methods to control kuhol and rats. Cenio planted the variety CS1 in his Kapurba area in panuig 2002, this is a variety he bred himself, which he insists is suited to organic fertiliser, he planted Vietnam in his Kuwari area, and the variety VD20 in his Nabahag area. Cenio also planted 5 trials during the season, 1 of which was a long term breeding trial; he was also assessing the suitability of *four other locally bred varieties to his rice paddies. Table 9.16 contains an economic assessment of Cenio's panuig 2002 season.*

Table 9.16: Economics of rice production – Sanchez family, *panuig* 2002 (Author's fieldwork, 2002)

Gross Yield (Y) (0.9 hectares)	2.76 tonnes of palay @11.50 pesos per kilo = 31740 pesos (3.06 t/has)
Inputs	*Costs (pesos)*
Seed for transplanting	0 (*balo-balo*)
Seed bed preparation	0
Paddy dyke preparation	0
Land preparation (hand tractor)	1200
Transplanting and pulling labour	2470
Fertilisation	0
Pest Control	0
Total Costs (T)	*3670*
Pito-Pito (P)	*435*
Owners Share (O)	*4600*
Net Yield (Y-T-P-O)	**23025 (2 tonnes of palay)**
Input/Output ration (Cost per kilo of net yield)	**0.15**

N.B. The Sanchez family received a premium price of 11.50 pesos per kilogram from SEARICE for their organic rice.

One of the most striking differences between the economic assessment above and that of the preceding farmers is the relationship between gross and net yield. In each of the above cases, the difference between the two was at least 50%. This compares with the 27.5% achieved by the Sanchez family. While there is no doubt that the fertiliser previously applied has contributed to this low margin, I have not included the amortized cost of this fertiliser, as each yearly application was fully repaid with the proceeds from each year's harvest. It is also very difficult to calculate what economic benefit the application of significant quantities of organic material has; to do this one would have to calculate the net benefit of the change in properties such as soil structure and soil ecology, which is clearly beyond the scope of this thesis, and should be seen more as an emergent property of the organic system itself. And even if the application of organic material was continuing, as it had done in the past, it would only amount between 450 and 675 pesos per season, which would change the net margin only slightly. What the above table attempts to convey is the way in which fertility benefits accrue over time, and how these rewards can be reaped by not having to apply fertiliser for a number of seasons. This is a characteristic of this particular organic system only, and this is clearly a very profitable arrangement for the Sanchez family, and has enabled them to save over 40,000 pesos in three seasons for the renovation of their home, which was completed in December 2002.

9.4 Summary

The case studies introduced above, and the preceding discussion of the agronomic practices of Campagao's farmers, suggest that Campagao is a place of great heterogeneity in agronomic practice and in levels of well being. In one community there exist migrant labourers struggling to produce enough food to feed their families, innovative farmers trialling new practices and taking significant risks, and large scale green revolution farmers spending thousands of pesos per season on expensive inputs. Some farmers scratch out a living relying almost totally on labour exchange institutions, family labour and local seed varieties and inputs, while others use the latest MVs and advice from the MAO.

However, I think the empirical material demonstrates that the vast majority of those interviewed are struggling with small landholdings, variable environments, lack of access to reliable irrigation, lack of access to economic capital, and the high cost of inputs. Yields are some of the lowest in the country, and the vast majority of farmers have enough food to feed their family, and if they are lucky, to pay production costs. Rice farming for the majority of farmers in Campagao is not an opportunity for improving family well being but simply a way to maintain the status quo. What is the way forward? How can rice farming become more than a cheap way of producing the family staple? How can it be made more sustainable? And what are the barriers to this? These questions will be addressed in the final two chapters.

10. An agroecological analysis of the adaptations of resource poor rice farmers – uncovering the necessary conditions for sustainable agriculture

Over the last 30 years the rice farmers of barangay Campagao have witnessed significant changes in almost all aspects of their rice farming systems. During this time, a relatively sustainable, low input system of rice production (the kinaraan) – that relied upon locally renewable inputs (i.e. seeds and organic fertiliser), local knowledge and cooperative labour exchange institutions – was replaced by a relatively unsustainable, high input system of rice production (the green revolution) that relied on extra-local and expensive inputs (i.e. seeds, inorganic fertilisers and pesticides), scientific knowledge, and credit-based economic relations of exchange. As the empirical data has indicated, some farmers adapted to these changes better than others.

A third system of rice production is now being trialled by some of the more innovative and experimentally minded of Campagao's farmers – these organic post green revolution strategies have helped a small number of farmers improve the sustainability of their rice farming systems. The sustainability of these systems has been improved through the application of large volumes of organic fertiliser (which enhances long term soil fertility), and through the planting of locally developed, genetically heterogeneous rice varieties that are suited to local conditions, and low input, organic methods of fertilisation.

One of the aims of this thesis is to investigate how Campagao's resource poor farmers have adapted to the significant changes discussed above, in practice. For example, how did they react to the increased instability of green revolution technology? What are the sustainability implications of these adaptations? How did they meet the increased production costs of the green revolution? The answers to these questions will enable us to understand better how those with limited resources react to agroecosystem change, and how they might react to future agricultural development initiatives. By understanding the adaptive strategies of resource poor farmers, hopefully more context specific and equitable agricultural development schemes may be developed and tailored to the needs of those with limited resources. This chapter will address the two research questions of this thesis: first, by discussing how the resource poor farmers of Campagao have adapted to agroecosystem change over time (i.e. the eco-social adaptations implemented over time); and second, by discussing the necessary conditions for the sustainability of rice farming in Campagao (i.e. the agroecological practices required for sustainable rice farming). The following and concluding chapter will discuss the sufficient conditions for sustainable agriculture, i.e. the social transformative conditions required to support and encourage agroecological practices.

As discussed in chapter 3, the theoretical goal of an agroecosystem is to provide social value (see Conway, 1987). Humans seek to derive short-term benefits from agroecosystems, in terms of food supply and income, but they also need long-term security in order to continue to derive food and income from agroecosystems into the future. When faced with changes such as new technology, rising costs, or pest and disease attack, farmers can modify their adaptations in a number of ways. These modifications may enable them to continue to derive social value from agroecosystems. However, these changes also affect the four properties of agroecosystems namely: productivity, stability, sustainability and equity.

The following review will analyse the context-specific adaptations employed by Campagao's farmers to maintain productivity and stability when faced with agroecosystem changes. It will also discuss the sustainability issues associated with these adaptations. Matters of equity will be discussed in the following chapter. Through this discussion, a number of systems-level sustainability principles will be introduced that may facilitate the development of more sustainable rice production systems for resource poor farmers.

10.1 The productivity adaptations of Campagao's farmers

The productivity of an agroecosystem is a quantitative measure of the output of valued product per unit of resource input (Conway, 1987). I would suggest that variation in productivity both within and between agroecosystems depends on the endowment of resources and the utilisation of these resources. As I indicated in the introduction, resource poor farmers suffer from a lack of access to natural, social, physical, human and economic capital, including any or all of these. The empirical data presented in this thesis suggests that the majority of Campagao's farmers suffer from a lack of economic capital and land (i.e. cash income and parcels of good quality farm land). Many of the farmers interviewed have small parcels of land, irrigation systems are often inadequate or non-existent, and land quality is variable. Taking into consideration these factors it is no surprise that the average gross yield witnessed during the panuig 2002 season was quite low (1.79 tonnes per hectare), even by Philippine standards.

As the data presented in chapter 9 demonstrated, yield and input/output ratio varied considerably during the panuig 2002 season. For example, amongst the four farming families represented in the case studies in section 9.3, the cost of inputs ranged from 0.15 pesos per kilo (net yield) for the organic post green revolution farmers (The Sanchez family), to 1.08 pesos per kilo (net yield) for the inorganic post green revolution farmers (The Angeles family). This significant difference in input cost was largely a product of the lower costs associated with the organic method, as well as other factors such as land quality, and favourable land tenure arrangements.

Yield also varied significantly (see table 9.12), ranging from 0.5 to 3.6 t/ha across all land parcels. In irrigated parcels the average yield was 2.08 t/ha (with a standard deviation of 0.66), while in the rain fed parcels the average yield was 1.54 t/ha (with a standard deviation of 0.56). The average yield witnessed during the panuig 2002 season (1.79 t/ha) is slightly more than the average yield for the Philippines in 1971 – 1.60 t/ha (i.e. before the Masagana 99 program), and slightly less than the average yield for all of Asia – 1.86 t/ha, in 1961 (FAOSTAT, 2004). So, 30 years after the launch of the Masagana 99 program, average yields in Campagao are still very similar to those attained during the kinaraan period, and much less than the average yield in the Philippines as a whole, which in 2002 was 3.27 tonnes/ha (FAOSTAT,2004).

Yield and input/output ratio are influenced by a broad array of factors ranging from access to land, seed quality, presence or absence of irrigation, labour arrangements, method of fertilisation, and pest and disease management. These factors vary within and between agroecosystems, and much time and effort is spent by agricultural experts quantifying the potential productivity-enhancing features of the aforementioned factors. However, I would suggest that these analyses are, in many cases, out of context. The agroecological analysis of productivity (particularly as it relates to resource poor farmers) should focus not only on the potential yield and productivity enhancing characteristics of any particular strategy, but should also investigate the context-specific ways in which resource poor farmers attempt to maintain or increase productivity, i.e. it should focus on what farmers actually do in practice.

As the empirical data from chapters 7, 8 and 9 have described, the resource poor farmers of Campagao have used many strategies to maintain or increase their gross yield, while keeping input costs to a minimum. In this instance, a strategy refers to a desired plan of action. For example, farmers may plan to use a particular rice variety in order to increase the productivity of their rice farm. In order to fulfil this plan or strategy however, farmers may utilise their economic, social or human capital. For example, if the farmer has a suitable amount of economic capital, they could simply purchase some high quality seed from a fellow farmer, or from a seed supply merchant. If they didn't have a suitable amount of economic capital however, they could, for example, trade seed with another farmer (balo-balo), access seed through the pito-pito system, or use their knowledge of varietal selection to develop their own strains of high quality seed, thus using their social and human capital endowments as a substitute for their lack of economic capital. In this instance, human capital refers to their own labour, and the skills and knowledge required to maintain or increase productivity.

The operationalisation of a strategy within a particular social and economic context is, for the purposes of the subsequent discussion, referred to as an adaptation. This is the action aspect of a strategy; it is the context specific utilisation of one's human, social or economic capital. While the economic capital adaptations available to resource poor farmers may be limited, the social and human capital adaptations are usually not as limited. There are several possible human and social capital adaptations that may fulfil any particular strategy. Clearly these types of adaptations (along with economic capital) should be expanded if the farming systems of resource poor farmers are to become more sustainable – this will be discussed further in the next chapter.

The resource poor farmers of Campagao have employed a diversity of adaptations in order to maintain or increase productivity during the kinaraan, green revolution and post green revolution periods. These adaptations are listed in table 10.1. Column one of the table lists the strategies employed to maintain or increase productivity, and columns two, three, and four outline the various social, human and economic capital adaptations utilised. The symbols alongside each adaptation (i.e. K for Kinaraan; GR for Green revolution, and PGR for Post Green Revolution) indicate which adaptations were, or are, prominent within each agroecosystem. While this table treats each adaptation as unique, it is important to note that farmers may utilise a number of adaptations to fulfil any one strategy.

There are a number of adaptations that have persisted throughout the three periods in question. These include entering into informal land tenure arrangements in order to reduce land rent and risk in rain fed parcels of land – despite land tenure laws which make this illegal; the tendency to use the balo-balo and pito-pito systems to access high quality seed; and the long history of varietal selection and varietal trials which have allowed Campagao's farmers to continue to produce genetically heterogeneous varieties that adapt well to local conditions. Other persistent adaptations include the utilisation of ajon-ajon, individual and family labour in order to reduce the cost of labour; a reliance upon one's own knowledge and initiative to combat pests and diseases, and to increase soil fertility; the social practice of planting in synchronicity in order to combat late season pest attack; and actively participating in the activities of the kanaway in order to ensure canals are maintained and improved.

If one examines the adaptations outlined in column four of table 10.1, one can see that a number of new economic capital adaptations arose during the green revolution period. This commodification of agriculture was, as chapter 5 has suggested, one of the primary characteristics of the green revolution. Many farmers – particularly those with favourable land parcels, moved away from the more traditional labour exchange and cost reducing adaptations and substituted those with economic capital, primarily in the form of credit. A lack of formal credit facilities has forced many farmers to use high interest credit available through local moneylenders. While many farmers continue to utilise the savings and credit facilities that exist within the numerous local indigenous social institutions, which are much more economically favourable, the rotating nature of these funds, and the fact that there is usually a high demand for funds at critical times during the rice production cycle, means these funds may not be available when required.

Table 10.1: Productivity adaptations utilised by Campagao's resource poor farmers during the kinaraan (K), green revolution (GR) and post green revolution (PGR) periods (Author's fieldwork, 2002).

Strategy	**Adaptation**		
	Social Capital	Human Capital	Economic Capital
Acquire high quality land	-Inheritance (K, GR, PGR) -Acquire land through bonds of trust (K, GR, PGR)		-Purchase land (K, GR, PGR) -Confiscate mortgaged land (K, GR, PGR)
Reduce land rent	-Negotiate favourable informal land tenure agreement for rain fed parcels of land (K, GR, PGR), -Negotiate formal land tenure agreement for irrigated land parcels under land reform provisions (GR, PGR).		-Assume mortgage rights as a tenant over the landowner (K, GR, PGR)
Access high quality seeds	-*Balo-Balo* (K, GR, PGR) - *Pito-Pito* (K, GR, PGR) -Join CFPRA, and access seeds through SEARICE – CDBC project (PGR) -Participate in Government or NGO agricultural development initiatives (GR, PGR)	-Varietal Selection (positive mass selection, negative mass selection, positive offtype selection) (K, GR, PGR) -Plant Breeding (PGR) -*Pito-Pito* (K, GR, PGR)	-Purchase seed from fellow farmer (K, GR, PGR) -Purchase seed from MAO or seed supply merchant (GR, PGR)
Optimise plant spacing	-*Ajon-Ajon* using *Margate* System (GR, PGR) -Exploit close relationship with labourers to convince them to plant using the Margate system -Acquire knowledge of plant spacing techniques through attendance at NGO workshops	-*Ajon-Ajon* using *Margate* System (GR, PGR)	-Pay labourers more money to plant according to *Margate* system (GR, PGR)
Reduce labour costs	-*Ajon – Ajon* (K, GR, PGR) -*Hungos - Hungos* (K) -*Bidding* (GR, PGR) -Family labour (K, GR, PGR)	-Exploit own labour (K, GR, PGR)	-*Pakyao* (contract labour for specific agricultural tasks) (PGR)

Strategy	Adaptation		
	Social Capital	Human Capital	Economic Capital
Improve soil fertility	-Access subsidised inorganic or organic fertilisers through government or NGO programs (GR, PGR) -Access another persons unwanted organic fertiliser (e.g. rice straw) (GR, PGR) -Use ROSCA funds available through membership of indigenous social institution to purchase fertiliser (e.g. *dayong, purok, ihaw-ihaw, ripa-ripa, kanaway*) (GR, PGR) -Use low credit interest available from family members to purchase fertiliser (GR, PGR) -Use low credit interest available through membership in Campagao cooperative, or farmers association to purchase fertiliser (GR, PGR)	-Use own knowledge and labour to make and apply organic fertiliser (K, GR, PGR) -Apply one's own rice straw	-Purchase inorganic fertiliser (GR, PGR) -Purchase organic fertiliser (GR, PGR) -Pay labourers to collect and/or make organic fertiliser (K, GR, PGR) -Avail high interest credit through local money lenders to purchase fertiliser (GR, PGR)
Control pests and diseases	-Plant in synchronicity (K, GR, PGR) -Participate in NGO or government integrated or ecological pest management field schools (GR, PGR) -Access to pest and diseases resistant varieties (see row 3 above)	-Use own labour and knowledge to control pests and diseases, including planting pest and diseases resistant varieties (K, GR, PGR) using cultural and mechanical methods described in table 8. 12	-Purchase pesticides to control pest and diseases (GR, PGR)
Improve irrigation systems	-Membership of *Kanaway* (K, GR, PGR) -Utilise family labour (K, GR, PGR	-Utilise own labour to maintain and construct canals (K, GR, PGR)	-Pay labourers to maintain/construct canals (K, GR, PGR)
Reduce harvest costs		-Exploit own or family labour to harvest rice crop (K, GR, PGR) -Foot threshing using a *nigo* (K, GR, PGR)	

The persistence of certain traditional adaptations such as ajon-ajon, and varietal selection, coupled with the introduction of adaptations such as plant breeding through the SEARICE–CDBC program, are examples of social and human capital adaptations that have allowed resource poor farmers to maintain, and in some cases improve, gross yields and input/output ratios. In times of economic shortage, farmers utilise ajon-ajon to reduce labour costs, and through plant breeding and selection they can get access to high quality seed without the need to purchase MVs from the MAO. As the discussion in chapter 9 suggested, in many cases, these locally developed varieties are much more suited to local conditions. However, if resource poor farmers are going to be able to increase their gross production substantially then non-economic adaptations, or more equitable economic adaptations, need to be made available to farmers for all aspects of the rice production cycle.

One area where social, human and low cost economic capital adaptations are lacking is in the area of soil fertility; this is a particularly important element of productivity that will be discussed at length in the forthcoming section on sustainability. While column 2 of table 10.1 lists a number of such adaptations, aside from the use of rice straw, the use of inorganic fertiliser – usually purchased with credit – is the most common fertilisation method. For the resource poor farmer, fertilisation is either the first or second highest economic input (alongside labour) in the rice production cycle. However, while there are non-economic ways to reduce the costs associated with labour, this cannot be said for fertilisation – except in the cases of those farmers who apply rice straw exclusively.

The SEARICE–CDBC chicken manure subsidisation scheme attempted to provide a low cost solution to soil fertility issues for CFPRA farmers; however this scheme failed because it was financially impossible for SEARICE to continue providing CFPRA farmers with chicken dung on credit, considering the farmers' poor credit repayment rates. More importantly though are the issues of dependency which surround such a scheme. The success of the organic fertilisation scheme, and the concomitant transition from an inorganic to an organic system of rice production (which has only been realised by 3 farmers), was dependent upon the continued subsidisation of SEARICE, which, as well as being financially untenable, was locally unsustainable. In contrast to the organic fertilisation scheme, the social, human and equitable economic capital adaptations (e.g., ajon-ajon, kanaway, ROSCA's, pito-pito, and balo-balo) that have persisted over time in Campagao have been independent, local, and socially sustainable adaptations that do not rely upon outside forces for their continuity, and which have managed to persist despite significant agroecosystem changes. Any organic farming initiative must also have these traits if it is to persist. The appropriation of the resources that inhere in local indigenous institutions is the one tried and tested way resource poor farmers can maintain or increase their productivity. In a climate of increasing input costs, and usurious credit arrangements, the expansion of local institutional solutions may be a viable way forward. I will these discuss these social capital issues further in the following chapter.

10.2. Maintaining stability

Stability is the constancy of productivity under a given set of environmental, economic and management pressures (Conway, 1985). For example, if one chooses to measure productivity as yield per unit area, then stability could be determined by measuring the variability in yield per unit area over a period of time. In the case of resource poor farmers who produce food primarily for home consumption, variability in production over time is a serious concern, and is the primary reason behind risk averse farming strategies. Unfortunately, many variables, which are outside of the control of farmers, affect the stability of production – these include climatic events such as El Niño, widespread pest outbreaks, or government agricultural policies. In response to such pressures, farmers could attempt to improve the biological stability of their agroecosystem by improving irrigation, devising new pest management strategies, or choosing a more suitable crop. However, their response to pressures, such as those above, is shaped by the socio-economic and management considerations that they face (Harwood, 1979). The particular strategy devised by the farmer to respond to external pressures, and the resulting adaptation, can only be understood within the social, cultural and economic context of production. For resource poor farmers the available choices are usually limited.

There have been many environmental, economic and management pressures that have affected the stability of Campagao's rice agroecosystems over the years. Clearly the most dramatic pressures arose during the green revolution, when a relatively stable mode of rice production (the kinaraan) was gradually replaced with what was to become a very unstable one. There is now a movement, by the organic farmers of Campagao at least, towards the restabilising of productivity, though at a higher level than that of the kinaraan. The following discussion will summarise the various environmental, economic and management pressures that affected stability during the three periods under review, and include details of how Campagao's resource poor farmers have attempted to maintain stability in the face of those pressures.

As the data in chapter 7 suggests, the kinaraan period was characterised by high stability, but low yield productivity. It was also a relatively self contained system, in that the transfer of genetic material was geographically limited, economic exchanges were local, inputs were locally renewable, and labour, and the social relations required to maintain labour exchange relations, were entirely village-based and non economic. As a consequence the major stability-affecting pressures stemmed from the environment – and these were primarily climatic and biological pressures such as cycles of drought (El Niño), typhoon, flood, and pest and diseases.

The farmers of Campagao used a number of strategies to maintain stability over time. The management of landraces -- which are known for their stable yield patterns (Zeven, 1998) – was one of the more prominent stabilising strategies. As described in chapter 7, farmers would plant landraces (primarily lubang and kainte) in rotation, they would ensure they did not plant the same variety in three successive seasons, and they would use varietal selection techniques to increase the pest and disease resistance and morphological characteristics of the favoured landraces. The planting of drought, flood and pest resistant varieties at the appropriate times was a key to maintaining stability between seasons.

The maintenance of the social relations that facilitated labour exchange was another stabilising strategy of significant importance. These social relations, and the trust which cemented them, were constantly reinforced through participation in local indigenous social institutions, such as the dayong, gala, kanaway and bijaay. In the pre-capitalist world of subsistence farming, local bonds of trust and reciprocity were essential to ensuring stable yields over time.

With the advent of the green revolution, the environmental pressures that affected stability were joined by a suite of economic and management pressures that acted to increase instability. While the yield productivity of the newly introduced green revolution technologies increased substantially, this was not the case for all farmers. Throughout the Philippines, productivity benefits were skewed towards large landholders (Bautista, 1997); this was also the case in Campagao. Those with relatively large, well-irrigated land parcels, economic capital, and access to modern varieties and techniques benefited from the new programs much more so than resource poor farmers. This maladaptation also extended to the stability of production. In the context of capital-intensive agriculture, those with sufficient economic capital resources could withstand the increased economic pressures of green revolution farming better than those without such resources. The increasing and variable cost of inorganic fertiliser, the move away from labour exchange towards cash labour, increased labour demand, and the introduction of mechanisation were all economic pressures that combined to increase the economic instability of green revolution farming for Campagao's resource poor farmers, much the same as it did elsewhere in the Philippines (Boyce, 1993).

Added to this were the agronomic effects of the new green revolution package. While many farmers experienced very high yield increases after the initial adoption of MVs (up to 300% in some cases), many farmers were forced, after a short time, to decrease input levels substantially, as the yield response of MVs, and the diminishing returns of basal fertilisation, became evident. In comparison with the kinaraan system, the stability of productivity now became largely tied to one's prevailing economic conditions. While the social relations that facilitated the exchange of labour remained as important as ever, the need to access economic capital for fertilisation, pest control and land preparation (at the very minimum) increased the vulnerability of resource poor farmers substantially; and this was exacerbated by local credit arrangements.

The agronomic causes of instability also extended to other aspects of the green revolution package. As we have seen, the rice plant genetic material available to resource poor farmers during the green revolution was limited, and of the MVs that were available, many were simply not genetically heterogeneous enough to adapt to the variable local conditions. The limited pest and disease resistance of some varieties, coupled with their intolerance to drought, acted to exacerbate the instability trend even further.

The resource poor farmers of Campagao did what they could to combat this increasing trend of instability: they began using rice straw as an organic supplement to inorganic fertiliser, they gravitated towards the more locally suited MVs (such as IR66), and they began developing FVs that exhibited pest resistance, tolerance to drought, and that reacted to the suboptimal levels of fertiliser they could afford to apply. This allowed farmers to reduce the instability that was characteristic of the beginning of the green revolution in Campagao.

However, producing low yields using labour exchange, suboptimal applications of fertiliser, and locally adaptable FVs is certainly not the type of adaptation strategy being promoted by the Philippine Government, nor is it the type of strategy promoted by SEARICE. Nevertheless it is the reactive strategy employed by the majority of Campagao's resource poor farmers to ensure stability over time in the current conditions – it is what they are forced to do to in order to continue farming. The Philippine government promotes the use of hybrid rice varieties and the optimal application of fertiliser, while SEARICE promotes organic farming, and the use of locally adaptable FVs. While both are poles apart in regards to their rural development strategies, both strategies have one thing in common – they cause instability. The former does so due to the demonstrated diminishing returns and economic instability of capital-intensive green revolution technology and the latter does so during the conversion phase. Unfortunately most of the resource poor farmers of Campagao lack the resources to go either way.

Since the onset of the SEARICE–CDBC organic farming program in 1996 there has been some improvement in the stability of production for those farmers who have managed to make the transition to organic farming. However, of the 26 CFPRA farmers who have tried the SEARICE-inspired organic methods, only three have been able to make a complete transition to organic farming. In all three cases this transition has been successful economically, and ecologically. While all three farmers witnessed decreases in production during the first few organic seasons (all were relatively high production farmers using green revolution technology), these yields soon increased and stabilised, and they are now some of the highest yields in the barangay, and similar to that achieved in well irrigated areas using the MVs and inorganic fertilisation levels suggested by the MAO.

The organic farmers of Campagao have achieved this stability and productivity in two ways. First, they have substituted fixed quantities of inorganic fertiliser, with staggered applications of organic fertiliser. The intent is to slowly rebuild the soil fertility and soil ecology lost after years of nutrient mining. Second, they rely only upon locally trialled – usually locally bred and/or selected - rice varieties that have a demonstrated response to organic conditions. After the soil fertility is re-established using the organic material, the farmers adapt their fertilisation strategy based on the perceived fertility needs of the farm – this is a skill learnt through observations over many seasons. Instead of the short-term approach that persisted throughout the green revolution, which consisted of applying a suboptimal amount of inorganic fertiliser each and every season, the organic farmers realise that fertility, and the maintenance of productivity, requires planning and a long-term perspective.

The farmers of Campagao have gone through unprecedented changes in the last 30 years. The increase in instability that accompanied the green revolution technologies was countered by reactive strategies that focussed on the environmentally sensitive management of rice plant genetic material, and the suboptimal application of fertiliser. This method supplies farming families with a low level of subsistence production, at low risk. However, as the next section will attest, this is hardly a sustainable strategy in the longer term. If the needs of resource poor farming families are to be met, then they need more than reactive, survival strategies. They need farming to give them opportunities. The need for locally renewable, stable, and highly productive strategies remains. In the next section some systems level principles will be discussed that may inform such strategies.

10.3 The sustainability of rice production in Campagao

Within the context of the crop agroecosystem, sustainability is defined as the capacity to maintain production through time, in the face of long-term ecological constraints and socio-economic pressures. It also includes the resilience of the system when faced by an acute shock (severe drought, devastating flood), or by intensive stresses such as nutrient mining, erosion or toxicity. As the discussion in chapter 3 suggested, the sustainability, stability and productivity of agroecosystems can be improved by mimicking, as far as possible, the ecological processes and services that exist in natural systems – this is the fundamental ecological principle of agroecology.

Table 3.3 outlined five principles that can enhance ecological processes within agroecosystems: securing favourable soil conditions; optimising nutrient availability and cycling; managing flows, water, air and solar radiation; diversifying species and genetics over time and space; and enhancing beneficial biological interactions and synergies. The following discussion will apply these five principles to the three crop agroecosystems under investigation in this thesis, the dual aims being to review the extent to which these five principles have been applied and to also uncover some context-specific strategies and adaptations that may facilitate the development of more sustainable rice production systems for resource poor farmers.

10.3.1 Maintaining soil fertility

Within the rice paddy agroecosystem, the maintenance of favourable soil conditions and soil fertility considerations are intimately linked, and therefore they will be dealt with together. Within the rice agroecosystem, soil fertility management largely revolves around the management of soil Nitrogen (N), which is the most limiting input in irrigated rice systems (DeDatta, *et al*, 1988). The affect of N on leaf development and canopy photosynthesis makes it fundamental to rice yield potential (Kropff *et al*, 1993). N fertility within rice paddy soils is determined by three factors: the N content of the soil; the N transformations that occur within the soil profile, during and after production; and the factors that influence N absorption by roots (Kundu and Ladha, 1999).

During the kinaraan period, N was generally applied in the form of guano sa buho. This was accompanied by deep ploughing to 45 centimetres using animal traction, which allowed for significant root penetration into the subsoil. While N application may have been low, the nutrient requirements of the low input ideotypes used at the time were also low, and the deep plough depth would have freed up subsoil N which is a very important source of N in rice paddy soils (Kundu and Ladha, 1999; Kirchoff *et al*, 2000). This mixture of deep ploughing, low uptake, and consistent N application in organic form, would have acted to preserve levels of native soil N, thus making this system more or less sustainable. The fact that all the inputs were locally renewable, and all the labour associated with land preparation, transplanting, and harvesting was undertaken within a framework of labour exchange, would have also contributed to the sustainability of this system.

Significant changes in soil fertility management and tillage occurred during the green revolution. Shallow tillage using a roto-tiller became the norm, high input varieties became commonplace, and large volumes of inorganic N were necessary to fertilise these high input varieties. These radical changes in tillage and fertility management had significant sustainability ramifications. The qualitative data introduced in chapter 7, i.e. the experience of Campagao's farmers during the early days of the green revolution, supports quantitative experiments that indicate a downward shift in N response in long term trials of green revolution technology (Cassman and Pingali, 1995). For example, many of the farmers I interviewed initially used the basal method of fertiliser application, and were impressed by the high yields achieved in the first few seasons, however they became disillusioned when more and more fertiliser had to be applied to attain the same high yields, eventually they compromised and adopted the less expensive approach of broadcasting complete fertiliser (16N:16P:16K) into paddy floodwaters 3 weeks after transplanting. This remains the dominant method of inorganic fertiliser application in Campagao. According to Fujisaka (1994), this technique is common in the Philippines, and is a reasonable response considering environmental and economic uncertainty, and the presence of Golden Kuhol.

From a sustainability perspective there are three problems with the contemporary soil fertility and soil management practices (i.e. tillage) of Campagao's farmers. First, there is the issue of inorganic N application, and, in particular, the inefficiency of broadcasting directly into flooded paddies. In the typical irrigated rice system, significant amounts of N are lost via ammonia volatization, denitrification, leaching and runoff (Kundu and Ladha, 1999); in the Philippines, trials of applied N loss ranged between 13% and 64%, with a mean of 43% (Buresh and DeDatta, 1990). In rainfed environments losses can be even higher, particularly if rain periods are intermittent, or if floods wash away the broadcast fertiliser – both these events happened to some farmers during the panuig 2002 season. Those farmers with rain fed paddies react to this uncertainty by simply not applying any inorganic fertiliser whatsoever, and relying solely on rice straw, and small amounts of other organic material. Flooding and the washing away of applied fertiliser has also been a problem for some of those farmers in flood prone areas who have trialled chicken dung.

There have been numerous suggestions as to how inorganic N application could be made more efficient, including the use of slow and controlled release fertilisers, using urea supergranules, and applying nitrification or urease inhibitors; however, these efficiency measures are beyond the economic means of most farmers (Cassman *et al*, 1998). If resource poor farmers have difficulty finding the means to apply suboptimal amounts of inorganic fertiliser, then clearly these high cost technical solutions are not solutions for them. And considering the high cost of inorganic fertiliser, and the usurious nature of local credit arrangements, simply applying more inorganic N does not seem like a viable option for Campagao's resource poor farmers either.

Another soil fertility management problem relates to the timing of N application. For example, the N applied three weeks after transplanting is rapidly depleted by plant uptake, gaseous losses or immobilization (Cassman *et al*, 1993); thus applied N is not available to the plant during the midtillering and reproductive stages, when the contribution of N is most important (Cassman *et al*, 1996). As there is no N application after panicle initialization, most of the N required during the reproductive phase is made available through the processes of N mineralization, Biological Nitrogen Fixation

(BNF), and the retrieval of subsoil N. As such, it is important to focus on increasing the efficiency of these processes.

However, this is a much more complicated issue than simply applying inorganic fertiliser three weeks after transplanting. It involves farmers adopting a long-term approach to soil fertility, as well as recognising the connection between soil fertility and tillage practices. This long-term approach to soil fertility definitely exists within CFPRA, but there was little evidence of it outside of the organisation. CFPRA's farmers wanted to trial chicken dung because they had seen how the three successful organic farmers were now saving on input costs by relying upon the long term fertility of their paddy soils, gained after years of chicken dung and rice straw application. However, as we have seen, financial concerns, issues of quality and supply, and the ongoing debt some farmers have with SEARICE, have precluded them from adopting the organic approach proffered through the SEARICE–CFPRA program.

The third problem relates to tillage practices. Shallow tillage using a roto-tiller is by far the most popular form of tillage in Campagao. However, this has been shown to significantly decrease root penetration depth (Kirchoff *et al*, 2000), leading to poor exploitation of subsoil N. Animal traction is still used for the last harrowing and for levelling, and, as we have seen, many poorer farmers prefer to use their own labour in order to save on the expense of mechanical tillage. By using the same tillage practices as those used during the kinaraan, these cost-saving farmers are helping free up subsoil N by increasing root penetration. Coupled with the fact that these risk averse farmers tend to use low input ideotypes that demonstrate favourable adaptations to varying environmental conditions, it seems these farmers are producing rice in essentially the same way as they did during the kinaraan, with the only significant difference being that they apply very small amounts of inorganic N when they can afford it, and apply rice straw regularly.

There are a number of crop, soil and water management strategies that together can address these tillage, efficiency and timing issues, and improve the soil fertility, and therefore the sustainability of lowland rice production. These strategies and the rationale behind them are contained in table 10.2.

Table 10.2: Strategies for improving soil fertility in lowland rice ecosystems (after Kundu and Ladha, 1999; Cassman *et al* 1998)

Strategy	Rationale
Conserve nitrate accumulated in the soil during non flooded periods	When flooded soils become dry, and aerobic, the ammonia (NH_4) formed via N mineralization of organic N, or from N fertiliser, is oxidised to form nitrate (NO_3). Most of this NO_3 is lost via leaching and denitrification when soils are subsequently flooded. As such, NO_3 needs to be conserved in paddy soils between seasons. This can be achieved by assimilating NO_3 into a dry season crop.
Recycle crop residues and use organic manure	The N supplying capacity of rice soils originates from organic matter (OM). OM increases the cation exchange capacity of soils, improves the soil's physical properties, and increases the CO_2 available to micro-organisms. Under anaerobic conditions OM decomposition is retarded, which can lead to a build up of OM and N over time. This may not be the case for dryland soils. The amount of N available for plant uptake, the rate of N loss, and the % of N immobilized in the soil varies depending on the Carbon–Nitrogen (C–N) ratio of the OM in question. Consistent application of OM with a high C–N ratio (e.g. rice straw) will lead to a greater increase in soil OM over time.
Enhance Biological Nitrogen Fixation (BNF)	BNF is an important contributor of N. In Philippine rice paddies the BNF–N contribution ranges between 30 to 52 kg N per ha^{-1}. This comes largely from indigenous associative and free-living N_2 fixing micro-organisms. However, BNF is adversely affected by the continuous flooding and puddling of lowland rice systems, and the broadcasting of inorganic N into paddy floodwaters also suppresses the growth and BNF rate of cyanobacteria. BNF contribution can be improved by introducing exogenous BNF plants. These include legumes, which can be grown in rotation with rice, and the N_2 fixing aquatic fern *Azolla,* which can be grown before transplanting, or as a cover crop with rice.
Reduce losses of applied N fertiliser	Losses of applied fertilizer N can be minimised by incorporating applied N into the soil at a depth of 5–10 cm rather than broadcasting into paddy floodwaters. Incorporating N into the mud without standing water can also help increase N efficiency.
Improve permeability	Permeability is an important factor in maintaining soil fertility, because percolating water carries dissolved oxygen to the root zone, diluting and eliminating toxic substances, which in poorly drained soils have been shown to inhibit N absorption by rice plants. Soil N availability in continuously saturated fields may be improved by soil drying, and by adopting suitable cropping systems.
Increase thickness of ploughed layer	The use of roto–tillers and the practice of puddling reduces the depth of the plough layer, and causes the development of a hard impervious layer at about 15cm. This inhibits root penetration and the extraction of subsoil N. Increasing the depth of primary tillage to 40cm can increase the availability of subsoil N.

The current irrigated rice production techniques used in Campagao contravene almost every one of the soil fertility strategies mentioned in table 10.2. For example, the use of roto-tillers creates an impervious hardpan; N is applied at the wrong time, and in the wrong way; BNF growth, and the rate of BNF are being inhibited; and nitrate is not being conserved between seasons. However, the recycling of crop residues, in the form of rice straw, is common and obviously contributes to the maintenance of soil fertility.

Despite the importance of these soil fertility strategies and their possible contribution to improving the sustainability of local rice production systems, the promotion of strategies such as these, either by the MAO or through the SEARICE–CFPRA project, was noticeably absent during my fieldwork. While SEARICE did promote the recycling of crop residues, and the use of organic materials, their soil fertility extension advice essentially ended there. While the MAO did promote the recycling of rice straw, and had promoted the use of chicken manure in the past, their advice and policies essentially encouraged farmers to use more inorganic N fertilizer.

The attitude of the MAO is no doubt driven by the productivity programs of the PNG, which, as we have seen, are centred on the use of high input hybrid rice varieties and inorganic fertilisers. However, I would suggest that there is also a conceptual bias towards inorganic fertiliser within the Campagao population. Since the beginning of the green revolution when inorganic fertiliser was first introduced, soil fertility has been correlated very strongly with inorganic N application, in the minds of many of Campagao's farmers. There is a linear, input driven conception of soil fertility issues. The relationship between inorganic N application and yields – which was so starkly demonstrated in the early days of the green revolution – helped consolidate this bias. Part of SEARICE's job should involve deconstructing this bias; clearly this will not occur if the product they promote (organic chicken manure) is seen as merely a substitute for inorganic N.

While the above analysis may help us understand that soil fertility issues are conceived of in a narrow way, such criticism does not contribute to the development and operationalisation of adaptations that may enable Campagao's resource poor farmers to improve their soil fertility, and therefore the sustainability of their rice production systems over time. If these adaptations are to be successful, they, not unlike the productivity adaptations outlined in table 10.1, will need to be locally realisable within the context of the economic, social and human capital available to Campagao's resource poor farmers. Table 10.3 contains details of some possible adaptations. The social capital and knowledge issues associated with these adaptations will be discussed in the next chapter.

Table 10.3: Possible soil fertility adaptations (Author's fieldwork, 2002)

Strategy	Adaptation
Conserve nitrate accumulated in the soil during non flooded periods	Trial, in cooperation with SEARICE/ CFPRA dry season legume crops (either staple or forage crops) that will assimilate NO_3. Assess economic and ecological benefits; SEARICE/CFPRA establish partnerships with NGOs/ research centres/ government bodies with expertise in dry season leguminous cropping in the Philippines; use existing labour exchange systems for tasks associated with Mung Bean or other legume cultivation; SEARICE/CFPRA undertake an education campaign on the importance of assimilating NO^3; promote existing knowledge relating to the cultivation of Mung Beans.
Recycle crop residues and use organic manure	Use labour exchange systems to collect large volumes of organic material (including manure), and develop communal compost heaps; use ROSCA funds available through membership of an indigenous social institution to purchase organic fertiliser; establish low interest loans through local indigenous social institutions specifically for the purchase of organic fertilizer; investigate the viability of using rice *tahop* as a form of high C–N organic fertiliser; SEARICE/CFPRA establish trials of other locally available forms of organic material; use own labour to collect organic material, and produce compost; use existing knowledge on the production of *bukasi* using indigenous micro-organisms.
Enhance BNF	Trial, in cooperation with SEARICE/ CFPRA dry season legume crops (either staple or forage crops) that will assimilate NO_3. Assess economic and ecological benefits; SEARICE/CFPRA establish partnerships with NGOs/ research centres/ government bodies with expertise in dry season leguminous cropping in the Philippines; use existing labour exchange systems for tasks associated with Mung Bean or other legume cultivation; CFPRA undertake an education campaign on the importance of enhancing BNF; SEARICE/CFPRA trial *Azolla* as a cover crop during rice production; CFPRA establish *Azolla* nursery; use existing knowledge relating to the cultivation of Mung Beans; intermittently drain saturated paddy soils in those areas with good irrigation control.
Reduce losses of applied N fertiliser	Incorporate inorganic N during land preparation; apply organic material in non floody season in areas with poor drainage.
Improve permeability	Intermittently drain saturated paddy soils in those areas with good irrigation control; CFPRA trial a mixture of wet/dry season cropping alternatives; use early maturing varieties during *panolilang* in order to increase fallow period.
Increase thickness of ploughed layer	SEARICE/CFPRA educate farmers on the importance of deep tillage using animal traction; encourage farmers to alternate between roto-tillers and deep tillage using animal traction.

10.3.2 Managing flows of water, air and solar radiation

The management of flows of water, air and solar radiation is fundamental to agroecosystem design for two reasons. First, there is the capacity to reduce water or soil loss through water management, erosion control, and microclimate management (Reijntjes *et al*, 1992), and secondly there is the potential to optimise growing conditions (e.g. sunlight, air circulation, water use) for specific crops (Altieri, 1995). In Campagao, one area in which the sustainability of rice production systems can be enhanced is through the optimisation of plant growth through changes to the spatial arrangement and density of seedlings when transplanted. Evidence of significant increases in yield arising from changes such as these has been documented for farmers using the System of Rice Intensification (SRI) in Madagascar and Southeast Asia (Uphoff, 2002). The SRI system is concerned with the qualitative development of rice plants through different growth cycles, as opposed to the quantitative measurement of growth or harvest index (Uphoff, 2002). The SRI system recognises that management practices such as plant spacing, planting density, and water management modify the growing environment, which in turn affects the capacity of plants to realise their genetic potential.

There are four primary management practices that underlie the SRI approach. First, rice seedlings are transplanted early – between 8 and 12 days; second, seedlings are planted singly; thirdly, seedlings are widely spaced, and planted in a square pattern; and fourthly, paddies remain unflooded (but saturated) during the vegetative growth phase. These strategies are designed to encourage the growth and development of robust root systems, which are seen as the key to growing highly productive, healthy rice plants (Uphoff, 2002). Unlike plant breeders who focus on above ground growth – particularly HI – SRI recognises the synchronous, coordinated way roots and tillers develop, and it also recognises the importance of the movement of sunlight and air around young seedlings (Uphoff, 2002).

In Campagao, little has changed in relation to plant spacing and density throughout the kinaraan, green revolution and post green revolution periods. Aside from the increased spacing between taller varieties that characterised the kinaraan, farmers have always planted multiple seedlings together, and little consideration has been given to these issues by NGOs such as SEARICE or the MAO. At present all of Campagao's farmers utilise the 'strike anywhere' system, which entails planting three week old seedlings in randomly spaced rows, in bundles of 3 to 5. This system acts as an insurance against pest and disease attack (e.g. Golden Kuhol) and climatic pressures, which are particularly acute for those in rain fed areas.

The lack of interest in plant spacing and density innovations does not stem from a lack of knowledge. Certainly, within CFPRA, knowledge of the Margate system (a plant spacing system very similar to SRI) is widespread; however, despite the acceptance of its benefits based on small field trials, the system has failed when introduced in the production environment, primarily because of difficulties convincing transplanters to adopt the new system. As we have seen, day labourers in Campagao like to work in a quick, regulated manner, and while they did adapt to the changes in spacing that accompanied the kinaraan–green revolution transition, they have been reluctant to plant singly, or to use any devices to measure plant spacings. The time taken to plant a single seedling, and the care that needs to be taken at the pulling stage, have acted to dissuade transplanters; this coupled with the increased labour costs for the already expensive process of transplanting, and the introduction of the Golden Kuhol, have all acted as disincentives to the adoption of plant spacing and density innovations.

Similar problems have plagued the SRI system in Madagascar, where this very promising system has suffered from high rates of disadoption, and low rates of spontaneous spread. Here social conformity was also an important barrier to change, but household labour and seasonal liquidity constraints also played a major part (Moser and Barrett, 2002). Unlike some of the other sustainability issues raised in this chapter, plant spacing and density innovations require the cooperation of day labourers, and fellow farmers. Transplanting is such a time critical, laborious and expensive task that the cooperation of labourers is crucial. While some very small landholders might be able to undertake the extra labour themselves, as these landholders are typically labourers as well, they may have to make a trade off between immediate income and some possible future increase in productivity. Finding lasting adaptations in this area is going to be very difficult; one way to address the issue may be to provide incentives for cooperation and group-based innovation. This issue will be addressed in the next chapter, when discussing social capital.

Another obvious sustainability issue relates to the management of water. The better management of water in irrigated areas, particularly drying regimes, and water conservation initiatives could no doubt help enhance the sustainability of local rice farming systems. The above section on nutrient management demonstrated the importance of drying regimes for the enhancement of BNF, and while some drying has been used as a means of pest control in Campagao (particularly for rats and Golden Kuhol), there is only one farmer I am aware of who explicitly uses drying regimes for plant development and nutritional reasons. While those farmers with dependable irrigation have developed their own methods for dealing with pest and disease attack based on observation, many have not realised the multiple benefits of drying regimes. If an adaptation already exists (periodic drying for pest and disease management), then one could assume that if the plant development and nutritional benefits of drying were demonstrated to farmers then it may be possible to integrate pest and disease, plant development and nutrition adaptations. The problem rests in the transmission of complex information – something that has not been addressed appropriately by the MAO or by SEARICE. The issues surrounding this and other aspects of information and knowledge transmission will be discussed in the next chapter.

In relation to the expansion of irrigation systems, the sustainability of rainfed agroecosystems in Campagao could no doubt be enhanced with better water drainage and supply arrangements. As we have seen, Campagao is characterised by a number of kanaways, many of which play important roles both agriculturally and socially. Despite the presence of such institutions, new water management initiatives in Campagao are rare, and there are many farmers whose paddies are located within a reasonable distance of possible water sources that do not exploit these resources, or attempt to join or create water management groups. There are a number of reasons for this and these will be discussed in the next chapter, when I discuss the social capital issues surrounding Campagao's agricultural institutions.

10.3.3 Diversifying species and genetics over time and space

As introduced in chapter 3, the principle of diversification of species and genetics over time is fundamental to the sustainability of agroecosystems. This principle is as relevant to rice farming as it is to more diverse systems. For example, a number of ecological interactions (plant/plant, and animal/plant) can be exploited over space and time to enhance the sustainability of rice agroecosystems, these include, but are not limited to, vegetable production on rice dykes, fish production within rice paddies, and agroforestry/rice systems (see Barzman and Desilles, 2002). The diversification of the rice genetic resource base through the introduction of new seeds and breeds is, as the empirical material in this thesis has demonstrated, also crucial to providing resource poor farmers with the basic resources needed to adapt to prevailing ecological and socio-economic circumstances.

In the case of Campagao's farmers a number of diversification adaptations could help improve the sustainability of local rice farming systems. Examples include the exploitation of plant/plant interactions through time (e.g. crop rotations/cover crops to enhance soil fertility), and space (e.g. the introduction of azolla, planting indigenous legumes around rice paddies, using repellent plants, vegetable production on rice dykes), and the exploitation of plant/animal interactions such as rice/fish and rice/duck. However, if we examine the adaptations of Campagao's farmers over time we find there has been little purposive exploitation of these interactions. This is in contrast to the excellent work that has taken place in increasing the rice plant genetic diversity through the CFPRA/CDBC partnership.

During the kinaraan period the exploitation of plant/plant interactions was limited to the use of repellent plants, usually planted on paddy dykes, and the rotation of lubang and kainte landraces between the panuig and panolilang seasons. There was no systematic crop rotation adaptation (e.g. rice/mung bean), and the use of cover crops during fallow periods was also absent. The only systematic crop rotation adaptations were those associated with the baow system (maize, camote, cassava), as discussed in chapter 7. There is also little evidence for the systematic exploitation of plant/animal interactions such as rice/duck or rice/fish.

While the conceptual model of crop rotation and the benefits of it clearly existed – for the baow system at least – the application of that model to the rice field agroecosystem did not occur in any systematic way. The rotation of rice with mung beans or maize seems to have been (and indeed, still is) an adventitious response to an economic opportunity or to climatic pressures, not a widespread systematic adaptation perceived to have multiple agroecological benefits.

With the arrival of the green revolution and the accompanying focus on improving rice yields through the use of high input varieties and synthetic fertilisers, the exploitation of ecological interactions, and the maintenance of diversity, decreased even further. As we have seen, rice plant genetic diversity decreased substantially during the green revolution, and the use of repellent plants became non existent, as more focus was placed on using modern varieties and modern means of pest control. The Masagana 99 program emphasised the importance of increasing rice production at the expense of other crops, and this pressure, along with the very substantial increases in yield witnessed in the early days of the green revolution in Campagao worked to reduce interest in agroecological approaches to rice farming even further.

During the mid-1990s, the importance of diversity for the sustainability of rice agroecosystems became the major focus of the CDBC/CFPRA partnership and since then major steps have been taken to address the erosion of rice plant genetic diversity. As discussed in chapter 8, the rice plant genetic resource base has improved substantially as a result of the CDBC/CFPRA collaboration. However, despite this there has been little improvement in the more complex area of exploiting plant/plant and plant/animal interactions. While CFPRA's farmers have conducted a number of trials on rice/mung bean rotations, rice/agroforestry, and rice/vegetable adaptations, these are by no means widespread or systematic.

There are a number of barriers to the diversification of rice farming systems in Campagao that need to be addressed before any systematic adaptations can be developed, including: knowing what plant/plant and plant/animal interactions to exploit; being able to access the plants and animals in question; knowing what indigenous species may be exploitable; appreciating from an agroecological perspective the importance of exploiting plant/plant and plant/animal interactions (e.g. the fertility advantages of rice/azolla interactions, rice/legume rotations); having the economic resources, time and available labour to develop suitable adaptations; and most importantly, changing the linear, input-centric conceptual model of modern rice farming with a more complex, holistic approach that recognises that rice production can be part of a broader agroecological strategy that has multiples goals.

At present the SEARICE approach to enhancing diversity has focussed specifically on enhancing rice plant genetic diversity, and while this has been successful, the more complicated systems approaches discussed above have not been addressed. However, if a true alternative to modern high input rice farming systems is to be developed then it is these complex issues that need to be addressed.

10.3.4 Enhancing beneficial biological interactions and synergies

Enhancing the beneficial biological interactions between the planned and unplanned, or associated, biodiversity within an agroecosystem is another key sustainability principle. As discussed in chapter 3, associated biodiversity plays an important role in pest control and regulation, nutrient cycling and the elimination of toxic residues (Hendrix *et al*, 1990). As the soil fertility benefits of enhancing soil biota have been discussed above, this section will focus specifically on the sustainability implications of pest regulation by associated biodiversity.

As the empirical material demonstrates, the kinaraan period was characterised by a non-technical, ritualistic approach to pest and disease management that involved the use of repellent plants and the invocation of local engkanto spirits (the patilow ritual). This chemical-free approach to pest and disease management, coupled with the use of highly resistant landraces and synchronous planting, created an environment of stability that would have ameliorated the chances of intense pest and disease attack. This created a natural balance between the beneficial and pathogenic associated biodiversity within the rice agroecosystem.

With the onset of the green revolution and the concurrent widespread use of pesticides, the regulatory services provided by beneficial insects within the rice agroecosystem became disrupted and this, coupled with the lower resistance of some modern high input varieties, acted to increase the instability of rice production. This was a phenomenon that had widespread implications throughout Southeast Asia (see Kenmore, 1991; Röling and van der Fliert, 1998). In Campagao, these technical, input-centric approaches to pest and disease control were also accompanied by religious dogma promulgated by the Catholic Church which denounced the patilow ritual as a means of ensuring a bountiful harvest. With this rise in technical rationality and Christian dogma, this traditional and – from an agroecological perspective – effective, method of pest control became extinct.

In recent years, as a greater awareness of the negative impacts of injudicious pesticide use became apparent through local IPM programs, and through the ongoing work of SEARICE, pesticide use in the barangay has continued to decrease. As the empirical material suggests, the vast majority of Campagao's farmers see pesticide application as unnecessary, and realise that cultural methods of control, particularly synchronous planting and the use of resistant varieties, are the most important pest and disease management practices. Therefore, when it comes to pest management there has almost been a full circle change throughout the three periods. Farmers have reverted back to the hands-off approach of the kinaraan period; however, this approach is based on experience and ecological understanding as opposed to belief based on ritual. However, from an agroecological perspective, the outcome in regards to the provision of a vital ecological service is the same.

The above discussion of the five ecological principles that inform the agroecological approach has uncovered some of the necessary conditions for the sustainability of rice agroecosystems. These include the long term management of soil N, encouraging deep tillage practices, focusing on the qualitative growth and development of rice plants, and adopting a more holistic, agroecoecosystems approach towards rice production. However, it is clear from the discussion that there are a number of very complex issues that need to be addressed if the sustainability of rice farming systems in Campagao is to be improved. While there has been some success in enhancing rice plant genetic diversity through local selection and breeding, issues such as soil fertility management, improving plant spacing and density, and diversifying species through time and space, continue to be more difficult problems. These problems are difficult because there are no simple technical solutions to them, they involve the acquisition of new knowledge, the creation of new types of cooperation, and they require a new epistemological perspective. I think it is obvious that there exists a linear, input-centric approach to rice production in Campagao that undermines some fundamental agroecological principles. This input bias is a direct result of the green revolution and its highly technocratic approach to rice farming. It needs to be countered by a holistic approach that fosters innovation, cooperation and the eco-social linking of more sustainable adaptations.

10.4 Summary

This review of the productivity, stability and sustainability issues surrounding rice farming in Campagao over time has uncovered some important lessons as to how resource poor farmers react to agroecosystem change, and what needs to be done to improve the sustainability of local rice farming systems. In Campagao, the kinaraan–green revolution transition was accompanied by a change in the pressures that affected farming adaptations: environmental pressures such as drought and flood were joined by economic pressures associated with rising input costs, and agronomic pressures arising from the unstable characteristics of the green revolution package. These pressures affected the productivity, stability and sustainability of rice production in the barangay.

Campagao's resource poor farmers have reacted to these changes by relying, where possible, on the social and human capital resources available to them. For example, in order to maintain productivity and stability farmers attempted to reduce labour costs wherever possible through the exploitation of local bonds of trust and cooperation, and through the increased exploitation of family labour; and they have increasingly relied on locally adaptable genetic diversity, and have accessed this diversity through local social institutions. Considering the economic pressures associated with modern rice farming, it is no surprise that Campagao's resource poor farmers have adopted or persisted with strategies that are independent of the broader agro-economic system, and that are at once locally renewable and socially sustainable. However, while these human and social capital strategies have worked for some elements of the rice production system – most notably labour and the provision of high quality seed – finding solutions to the problem of soil fertility has not been so easy.

However, a strategy that involves reducing inputs costs where possible, applying suboptimal amounts of inorganic fertiliser, and using locally adaptable FVs is hardly a proactive rural development strategy – but this is one that resource poor farmers are being forced into. Within this context rice farming is not an opportunity for improving well-being but a means of producing a subsistence level of food at minimal cost. Due to a lack of capital resources, and a number of issues associated with the management of the CDBC project, the majority of Campagao's farmers have not been able to realise the advantages of the organic farming method that has been successfully adopted by only three farmers in the barangay.

Furthermore, a number of sustainability issues associated with rice production in Campagao are undermining the very resource base upon which agriculture depends, these include nutrient mining and poor tillage practices. There are strategies that could be employed to improve the sustainability of local rice farming systems; however, these are complex problems that will require the adoption of a more long term, and holistic conception of rice farming than that which currently exists.

The above discussion suggests that any sustainability adaptations will need to be independent of outside economic forces and locally renewable (both bio-physically and socially). They will also need to be integrated into the local institutional framework of the barangay. This will not be an easy task, and there are many barriers to this. The next chapter will address the social transformative conditions that will be required to support agroecologically informed practices.

11. Social transformation towards sustainability

Having discussed some of the necessary conditions for sustainable agriculture in the barangay, and the ways in which Campagao's farmers have adapted to agroecosystem changes over time, I will now move on to discuss the broader social transformative issues that need to be addressed if more sustainable systems of rice production are to be locally realised. These remarks will draw heavily on the social transformative concepts of transformative participatory development, context-dependent social capital and subaltern knowledge introduced in chapter 4.

One of the cental contentions of this thesis has been that agroecological practices that may enhance the biophysical sustainability of an agroecosystem are necessary but not sufficient conditions for sustainable agriculture. As this thesis has demonstrated agricultural adaptations are intimately linked with local social practices, and shaped and constrained by epistemological biases and power relations. Therefore, in my opinion it is not enough to develop ecologically informed practices without creating the transformative conditions that may support and encourage the operationalisation of these practices.

Within the context of rice production in Campagao, this chapter will suggest which power relations require transformation, the barriers to such transformation, and how resource poor farmers may begin the transformative process. It will also discuss the importance of building and mobilizing social capital, and how resource poor farmers can support local agroecological practices by linking these practices with the institutions that they already control. The penultimate section will include a discussion of the importance of developing local knowledge for sustainability, especially knowledge that addresses systems level concepts. The chapter will conclude will a summary of the main findings of the thesis, and a discussion of the implications of these findings for agricultural development in general, and agroecology in particular.

11.1 Transforming power relations

In chapter 4, I discussed the concept of transformative participatory development (TPD) and suggested that this was the only type of participatory development that explicitly addressed the issue of social transformation. Within this conception, participants are viewed as agents for change, not stakeholders; there is a focus on developing critical consciousness; and there is a concern with citizenship as practice (i.e. direct political involvement). The separation of economic and political power and the building of institutions to support TPD are also important.

The empirical and theoretical material introduced in this thesis explored the various power relations that shape and constrain the lives of resource poor farmers. These include the role of patrimony and corruption in Philippine politics, the ramifications of a weak state facing strong regional elites, the neutralization of land reform, and the powerful agricultural productivist agenda of the NGP. At a local level these issues manifest themselves in a number of ways, including: a lack of meaningful participation in local political institutions, bribery and corruption at the level of barangay politics, a lack of local land redistribution, non engagement with government agencies, protest against the Plant Variety Protection Act, and attempts to develop alternative agricultural development strategies.

Aside from the epistemological exclusion of farmers – which will be discussed in section 11.3, and the various barriers to the building and mobilization of social capital – which will be discussed in section 11.2, this thesis has identified three other power-related issues that require transformation if the conditions for more sustainable agriculture are to be met: the need for real redistributive land reform, a lack of effective political participation and the onerous provisions of the PVP Act. These will now be discussed in turn.

11.1.1 Land reform: barriers and opportunities

As the empirical material presented in chapters 6 and 9 suggests, land tenure in Campagao is characterised by personalistic ties between landlord and tenant, informal and illegal land tenure agreements based on the tinulo system are common, land holdings are very small, and, aside from the signing of lease agreements in well irrigated areas, very little agrarian reform has taken place. As land is the most precious resource for poor farmers, and as the payments they make under land tenure agreements are significant, any positive changes to land tenure laws would have an immediate impact on the security of land tenure, and on the net profit margins of resource poor farmers. Increased net profit margins would provide farmers with more resources to devote towards the implementation of long term, agroecologically informed rice production practices. For those in marginal areas, securing a type of lease that recognised seasonal yield fluctuations (i.e. non fixed rental) would significantly improve tenure security and net profit margins.

However, according to Borras (2002), the prospects for real redistributive land reform under the Macapagal-Arroyo administration remain bleak, primarily because Macapagal-Arroyo fails to challenge the power of the land-based elites whose political support she needs (Borras, 2002). Therefore the question must be asked: How can landlord resistance can be overcome? Borras (2001) argues that symbiotic interaction between pro-reform state and societal actors (i.e. proactive reformists within the polity and bureaucracy, and politically active farmer/peasant groups) is a prerequisite, as is the identification of political opportunities to weaken the anti-reform coalition.

The type of political opportunism required to destabilise the land-based elites will only be achieved if local farmers strengthen their knowledge of agrarian reform, their organisational capacity, and their alliances with national peasant-based groups. This is borne out by the fact that positive agrarian reform outcomes in the Philippines have mainly occurred in regions where farmer organisation is strong (see Putzel, 1992).

One of the most intriguing things about my research in Campagao was the general lack of knowledge about agrarian reform. For example, many farmers had not heard of the CARP, and those who were aware of it where unsure of its provisions, and were waiting for its implementation. For most farmers, agrarian reform involved receiving a letter from the DAR asking them to attend the DAR office to sign an agreement with their landowner, agreements which, as we have seen, were ignored in many cases (and for good reason).

This problem of ambivalence to agrarian reform is an important issue. First there is ambivalence based on a lack of knowledge, and second there is ambivalence arising from a need to choose between severing the social bonds that have traditionally been relied upon for security (i.e. informal land tenure agreements), and replacing them with a reliance on state run institutions, institutions which, in the Philippines at least, are less than adequate (Hirtz, 1998). Farmers are asked to replace people they trust with a state they don't. In neglecting these strong social bonds, the state has demonstrated a structural ignorance of the local conditions of production in the countryside (Hirtz, 1998), and this ignorance, coupled with ongoing landlord resistance, will continue to affect the success of land reform programs in the Philippines.

To address these issues, CFPRA and SEARICE will need to broaden their agricultural development agenda to include education about agrarian reform, as well as political activism against the slow pace of agrarian reform in the Philippine countryside. They will also need to develop strategic alliances with other peasant based groups. However, they will need to be very careful to ensure their land redistribution messages are not conflated with the militant messages of the NPA. A problem with the scaling up of political activity on this issue relates to the suspicion such activity would be met with in Campagao. The history of insurgency has instilled in local residents a mistrust of leftist organisations with anti-state views. While many farmers sympathise with the goals of the NPA (one of which is wholesale land redistribution), they do not want to be associated with this militant group, and many have suffered personally at the hands of the military and the NPA.

11.1.2 The Plant Variety Protection Act

The passing of the PVP Act in 2002, which, as chapter 8 explains, gives plant breeders protection over the rights of new varieties, exemplifies the failure of the Philippine government to adequately acknowledge the important role local seed supply systems play in the lives of resource poor farmers, as well as ignoring the important role farmers play in varietal selection and breeding. While farmers and bona fide farmer groups can claim rights over varieties they develop, the resourcing issues involved in this process will essentially exclude many farmers. This ignorance of the role farmers play as plant breeders, and the importance of FVs in resource poor rice farming communities, demonstrates the epistemological exclusivity of the NGP.

As the empirical material in this thesis has demonstrated, the development and free dissemination of locally adaptable FVs has been one of the most important adaptations developed by local farmers, and has been the mainstay of local rice production during the kinaraan, green revolution and post green revolution periods. The work CFPRA has done in this area has been particularly important. For example, 87% of the trials undertaken by CFPRA's farmers between 1996 and 2002 were with FVs that, under the current legislation, could have protection. And more importantly, a large proportion of the 40 varieties developed by CFPRA farmers, and used in production, were derived from MVs such as IR66 which would certainly be covered by the new legislation. Similarly, all of the CS varieties (n=26) bred by Cenio Sanchez, many of which are now being used in production, and which were derived from crossings with two MVs, would now be classified as illegally derived varieties.

Since the introduction of the PVP legislation, CFPRA and the coordinators of the SEARICE–CDBC project have been actively protesting against its provisions using a number of means, including protest plantings of 'illegally derived' varieties, lobbying politicians, and developing community registries and affadavits. The community registry is an information system which contains the details of local rice plant genetic diversity, including characterisations of each variety. The aim of compiling the registry is to assert community control over these varieties, in the hope that this public disclosure will in some way counter the provisions of the PVP Act. This is a strategy being adopted by many NGOs and POs throughout the Philippines. CFPRA have also expanded their community seed bank, and are actively working with CVSCAFT to regenerate ex situ genetic materials. CFPRA members have also signed a community affadavit that lists all the varieties used locally, characterises those varieties, details the number of years a variety has existed in the community, and describes how entries to the registry will be made.

This proactive response against the PVP Act clearly demonstrates that local farmers react strongly to overt attempts to take away rights they have had for hundreds of years. It is not yet known how the community registry strategy will fare when faced with challenges under the PVP legislation; however, from the perspective of community organising, this opposition to the PVP Act may act as a starting point for the assertion of other rights which are necessary for the realisation of more sustainable local practices, and SEARICE should do what it can to make the connections between the PVP Act and the broader productivist ethic of the NGP, which through its ignorance of the conditions facing resource poor rice farmers is eroding the very right to produce rice in a sustainable manner.

11.1.3 Citizenship in practice

Citizenship in practice is characterised by the direct political involvement of agents in the decision making processes that affect their lives, as well as control over the resources and institutions that provide for material well being (Hickey and Mohan, 2003). It gives political communities the power to shape their own futures based on their perceived needs, and it is explicitly focused on improving the material well being of the underprivileged.

Considering the productivist agenda of the NGP, the recent implementation of the PVP Act, and the lack of redistributive land reform in the Philippines (all significant barriers to the realisation of agroecologically informed practices), one can assume that the NGP has no interest in promoting alternative agricultural policies that may benefit resource poor farmers. Therefore it seems that within the current political environment, it will only be when farmers themselves have direct control over political institutions and the resources that inhere therein that they will be able to implement alternative agricultural development programs that address the sustainability issues that they face.

As far as political participation in Campagao is concerned, there are several barriers to the local realisation of citizenship in practice. These include the persistence of patrimony, bribery and corruption at the level of local politics, and the suspicion associated with alternative political movements. The patrimonious nature of local social relations is exemplified locally by the term 'machinery', as introduced in chapter

5. The barangay is effectively ruled by a wealthy local family who have the 'machinery' to govern. Not only is possessing 'machinery' a prerequisite to facilitating things within the barangay, it is also required to obtain power in the first place. In Campagao local political power does not rest in the state, i.e. it is not embodied in the position of barangay captain – power rests in the individual – and this power is a result of individual wealth and the possession of various other forms of capital. It seems that not unlike the past, those with wealth and status are thought to be more suitable to govern.

The dynastic-like ruling of a barangay by wealthy local elites is the complete antithesis of citizenship in practice. This problem, however, is a deeply entrenched one. As chapter 5 has also shown, patrimonial ties are strengthened locally through the exploitation of the Filipino value *utang na loob*, a feeling wherein one is compelled to reciprocate something offered. This feeling of reciprocity helped facilitate the widespread bribery and corruption that I witnessed during the 2002 barangay elections.

As chapter 6 discussed, since the implementation of an honorarium for government service as a kagawad (councillor), these corrupt practices have spread throughout the barangay, as resource poor farmers try to secure a very useful supplementary income. While some of these kagawad are in political opposition to the incumbent barangay captain, the wealth and status of the local incumbent ensures he maintains control over the council and the barangay's internal revenue allotment.

The entrenched nature of bribery and corruption and the personalistic nature of local politics have given rise to an opposition movement in Campagao who want to transform local politics. Their hopes for a more accountable and representative local government, and their unsuccessful attempt to oust the incumbent barangay captain, was described in chapter 6. It is here, at the level of local politics, that citizenship in practice needs to be realised. Not only does there need to be a well organised, politically informed opposition to the status quo, but individuals in government, or those seeking election, need to restore dignity to local political processes by being exemplars of democracy and good governance themselves, in order to restore trust in local government.

However, local anti-administration politics is very difficult in a place with a history of insurgency. Those associated with left wing or human rights groups usually keep a low profile, and local people are very wary of NGOs with leftist views. Unfortunately, this climate of suspicion (and no doubt the presence of a significant military contingent in a neighbouring barangay) makes those with legitimate views on land reform, farmers' rights, the productivist policies of the NGP, or any views that may be thought of as 'left', feel like subversives.

To overcome this feeling of subversiveness, resource farmers, local landless labourers and their supporters could actively join together and explicitly align themselves with legitimate, non militant political movements in the Philippines; movements such as Akbayan – a relatively mainstream leftist political party with increasing membership throughout Bohol and the Philippines. Overcoming the entrenched cultural, political and psychological barriers to change will not be easy, however, it seems that in the Philippines, the concerns of the rural poor will ever only be addressed by the rural poor themselves; therefore, the only avenue open to them is direct political involvement.

11.2 Building and mobilising social capital for sustainability

In chapter 4, I introduced two conceptions of social capital that have influenced my thinking about social relations in Campagao. The first is the context-dependent model of social capital espoused by Foley and Edwards (1999); this tripartite model focuses on the resources that inhere in groups (i.e. the social location of social capital), access to these resources, and how resources are used through individual and collective agency. The second is the concept of bracing social capital, introduced by Rydin and Holman (2004), which is defined as the targeted and instrumental use of social capital by a group with common norms, to solve common problems.

The empirical material introduced throughout this thesis has painted a picture of a barangay with a vibrant social life, full of religious, community, indigenous and government sponsored groups, all of which help local farmers meet the demands of day to day life. These groups provide labour and small amounts of credit and savings in times of need; they allow one to get married; and they even look after you when you die. But, aside from day to day activities, the question must be asked how are they able to, and how can they, contribute towards the transformation of the oppressive political and economic conditions faced by resource poor farmers?

In the following discussion I will point out some of the constraints that inhibit the building and mobilisation of transformative social capital within Campagao; these include a lack of knowledge about groups, problems with access to close knit groups, and a lack of resources within groups. I will then move on to discuss ways in which the concept of bracing social capital may be utilised to good effect, most importantly through the instrumental use of the social capital that already exists in the barangay's numerous social institutions. Drawing on the concepts that underlie the human ecological approach, I will stress the importance of linking these bracing social capital initiatives with agroecological practices, and I will give some examples of where such linking is needed if more sustainable systems of rice production are to be locally realised.

11.2.1 Barriers to the building and mobilisation of social capital in Campagao

One of the most obvious barriers to the building and mobilization of social capital in the barangay is the lack of knowledge about and access to groups and their activities. For example a significant proportion of the non-CFPRA farmers I interviewed had no knowledge of CFPRA or its activities, this even extended to relatives and friends of CFPRA members. Typically those farmers who had no knowledge of CFPRA usually had no historical association with agricultural development initiatives in the past as well (for example, membership of the now defunct FA, or IPM program). Despite this, many of these farmers had benefited from the varietal selection and breeding initiatives of CFPRA, and had accessed high quality FVs through either the balo-balo or pito-pito systems, so despite not being members of CFPRA these farmers where able to exploit other social capital resources to access high quality seed.

Accessing seed is one thing, but accessing the knowledge that is required to select and breed high quality seed is another. While material things such as seed may be appropriated through local farmer networks, knowledge is not as easily transferable. For example, as we have seen, CFPRA members are involved in a broader information sharing and knowledge generating exercise that is explicitly aimed at developing alternative rice production practices; as such, they have a good understanding of issues such as: ecological pest management, the negative impacts of hybrid rice varieties, the PVP Act, the importance of long term soil fertility, matching varieties to different environments. While they don't always have the resources to operationalise this knowledge in production, they are at least aware of how the sustainability of their rice farming systems can be improved, and how it is being compromised. This knowledge can only be gained through participation in the workshops, seminars and field trials of CFPRA. As such, while the material output of CFPRA may be available to all, the knowledge of sustainability issues is only available to CFPRA members, thus creating a significant knowledge gradient across the barangay.

Gaining access to CFPRA and other groups however is not as easy as it may seem. For example, when, during my research, I told non-CFPRA farmers about the activities of CFPRA, many of them expressed an interest in joining, and some appeared very enthusiastic about this. However, as the months progressed, none of these enthusiastic farmers found the time to attend any CFPRA meetings. I found this strange, as many of them were friends with CFPRA farmers, and all knew the details of the meetings. I subsequently discovered that there is a social protocol in Campagao that inhibits people from simply joining established groups – for example some farmers said they would feel ashamed to join CFPRA without an invitation. Considering the fact that groups such as CFPRA, and other bonding social capital groups, are founded on trust and mutual responsibility, it is no surprise that outsiders feel inhibited from imposing themselves upon such groups, without the social approval of group members, as expressed through an invitation.

Another reason for adopting a cautious approach towards membership in a bonding social capital group stems from a desire not to be overextended. Bonding social capital groups are based on trust and reciprocity, and require participation in all the activities of the group, which in Campagao is usually enforced through a fine for non attendance. As Bourdieu (1986) suggests, the ongoing sociability required to maintain membership of the group requires the investment of time and energy, and therefore either, directly or indirectly, economic capital. In the case of Campagao, the requirement for periodic outlays of economic capital through participation in multiple ROSCAs, while beneficial in the long term, can place strain on those with small and unpredictable incomes in the short term.

In Campagao the bonding social capital commitments of farmers are quite high; for example, every farmer I interviewed is a member of the dayong, cluster (or other religious group), and purok, all of which require compulsory attendance at meetings, and either compulsory contributions, or compulsory participation in ROSCAs. The majority of farmers are also members of the gala, or minag soon – to raise funds for weddings, not to mention participation in the activities of the kanaway, farmers' cooperative, CFPRA, Couples for Christ, parish church, barangay health service, barangay tanod, barangay council, and parents and teachers association. Most farmers actively participate in at least five of these groups, and some up to ten.

However, as the Foley and Edwards (1999) model of social capital implies, participation in groups is not a proxy for improved well being. If one considers the social location of the social capital in Campagao, it is evident that the resources that inhere in most of the abovementioned groups, while very useful for meeting day to day needs, are not sufficient for the betterment of material well being, or for investment in and furtherance of local development initiatives. For example, while ROSCAs form an important part of the informal local economy, and are the main activity of most groups, the funds retrieved from them are usually small and, due to their rotating nature, are not always accessible when they need to be. I would argue that a more instrumental use of the social capital resources that already exist in Campagao is needed if the material circumstances of resource poor farmers are to be improved. This will be discussed in the next section.

11.2.2 Bracing social capital and the linking of social and ecological systems

Throughout this thesis there have been numerous examples of how farmers exploit their social capital resources to achieve specific agricultural goals. For example, the ajon-ajon, kanaway and balo-balo institutions have all played important roles throughout the kinaraan, green revolution and post green revolution periods. The persistence of these institutions is tied to the fact that they are intimately linked with agricultural practice at the same time as providing an alternative to economic capital.

In chapter 10, I identified a number of the necessary conditions for sustainable rice production in Campagao; these included the need to address long term soil fertility, the need to change tillage practices, the need to focus on the qualitative development of rice plants through experiments with plant spacing and density, and the need to increase the diversity of local rice agroecosystems. Most of these practices are labour intensive, and require economic capital outlays which may not be available to resource poor farmers individually; as such, some cooperation with other farmers and labourers will be required to access sufficient labour and capital. I would suggest that if these practices are to become operationalised in the barangay they will need to be supported by institutional measures that, like those mentioned above, are reliable and persistent. I would argue that education about these conditions, and/or the introduction of new technology from outside, will not be enough to support agroecologically informed practices. While these are important, I believe that institutional measures that can link the social with the ecological will be of primary importance.

One way in which this might be achieved is through the targeted and instrumental use (by resource poor farmers) of the social capital that already exists in the numerous local indigenous, religious, and community institutions in the barangay. Exploiting these existing institutions is important for a number of reasons; firstly, these institutions, and the rules that govern them, are solely controlled by local people for local people, and as such they are manifestations of citizenship in practice; secondly, it will help overcome the knowledge and access barriers discussed above, as everyone is a member of groups such as the purok and dayong; thirdly, many of these groups are linked geographically (especially the puroks), which means that labour is close at hand; fourthly, members already share common norms, and rules and sanctions already exist within the groups; fifthly, these groups exist independently of NGO or government sponsored agricultural development programs, and therefore the dependency problem discussed in chapter 10 will not arise; and sixthly, as these groups perform other vitally important social roles they will not disappear from the social landscape.

The instrumental use of these institutions to a developmental end will rely upon the mobilisation of individual and collective agency, guided by a commitment to alternative forms of agricultural development. Seeking out opportunities to link with other groups, developing leadership skills, and finding new and innovative ways to diversify capital build-up schemes and microcredit initiatives will be essential. The difficult task will be to expand the scope of the groups to include new forms of cooperation and capital build-up that are specifically targeted towards agroecological practices. As we have seen, there are many adaptations that farmers can employ to produce a rice crop, and not all farmers will be convinced of the benefits of agroecologically informed approaches. The key will be to start small with a group of agroecologically informed farmers, and to prove through trials and social learning that agroecological initiatives work in practice. In contrast to the beginning of the SEARICE–CDBC program in 1996, it will be necessary to ensure that viable, locally renewable techniques and institutional support for initiatives is in place at the outset.

While I think it is important for specific groups to develop their own adaptations based on their own perceived needs, some examples of particular adaptations that may be useful agroecologically include:

- capital build-up schemes that subsidise the cost of plant spacing and density experiments for group members, which may prove to labourers and other farmers the benefits of planting singly, and the labour increases incurred (if any);
- the expansion of labour exchange to include the collection of organic material, and the making of organic compost for communal use;
- capital build-up schemes to support the purchase of organic materials in a form that can be stored locally;

- capital build-up schemes that support the purchase of carabaos and ploughing equipment for communal use;
- developing communal agrobiodiversity practices with labourers that allow labourers to access a portion of a lumber, vegetable, or fish crop in return for providing labour in those areas;
- expanding labour exchange to include the establishment of cover crops and leguminous crops such as mung beans.

While there is no doubt that developing adaptations such as these will be a time-consuming and difficult process, the people of Campagao have demonstrated for a long time a capacity to work communally to reach specific goals. With the right institutional support and education about the importance of agroecologically informed practices, the conditions that can support these practices can be developed. While new technologies may be useful in the future, the first step is to create the conditions for innovative forms of social interaction that will help with the development of new adaptations. If agroecological practices are to become persistent adaptations with meaningful benefits for all resource poor farmers, then they need to be accessible within the context of local social practice. Doing this will require a societal, as well as an epistemological transformation, as will be discussed in the next section.

11.3 Subaltern knowledge towards sustainability

The transformation of power relations and the development of institutions that support agroecologically informed practices will only become actualised in Campagao once two epistemological conditions are met. The first condition relates to the local realisation of *Conscientizacao*, the Frierean concept of critical consciousness through which people come to appreciate the nature of their social, political and economic oppression. The second condition is the building of local knowledge(s) and innovative modes of social organisation that allow local farmers to redress the aforementioned oppressive conditions, and to develop local forms of agricultural production that contribute to the betterment of their well being. The building of this subaltern knowledge is an overtly political attempt to empower local people through the strategic deployment of their own knowledge, and other knowledges (including western scientific knowledge).

There are a number of barriers to the development of such knowledge within the local community. First, there is a lack of knowledge about possible alternative agricultural strategies, which is exacerbated by the fact that agroecological knowledge is restricted to very few farmers within the barangay. As mentioned in the previous section, this will need to be addressed through the scaling up of agroecological education and social learning within the barangay's numerous local institutions, particularly the indigenous institutions.

However, as discussed in chapter 10, this will require an epistemological transformation with regards to how farmers think about certain agricultural production problems, and possible solutions. For example, this thesis has identified a reductionist-technological bias amongst Campagao's farmers (as evidenced by their practice) that has been influenced significantly by the epistemology and policies of the green revolution. There will be a need to adopt a more holistic, systems perspective if the necessary conditions for sustainable agriculture discussed in chapter 10 are to be met.

As chapter 10 suggested, issues such as the connection between tillage practices and soil fertility, the importance of long term soil fertility, and the role of diversity in rice agroecosystems are fundamentally important to sustainable rice production. I think it is naive to assume that *all* farmers have systemic, holistic knowledge about interactions such as these. While farmers no doubt understand many interactions within their fields, this knowledge may not be that useful – as far as improving the sustainability of their rice agroecosystem, or improving its financial viability is concerned – if knowledge of the particular agroecological conditions that can improve the productivity and sustainability of local rice production is missing.

Second, there is a lack of knowledge about the negative impacts of the agricultural development and land reform policies of the NGP, and the connections these policies have to the material well being of local farmers. While there is some reasonable knowledge (among CFPRA farmers at least), of overt attempts to restrict the rights of farmers (e.g. the PVP act), more focus needs to be placed (by SEARICE, CFPRA and individual farmers) on understanding the ways in which other state actions affect the lives of resource poor farmers (e.g. the neutralization of land reform, the promotion of hybrid rice varieties, promoting the widespread use of inorganic fertiliser in areas with usurious local credit arrangements etc). This should also extend to building knowledge of the epistemological bias of state-sponsored agricultural development programs and employees (e.g. the dismissal of local knowledge in preference to reductionist-technological knowledge, and the failure to recognise that farmers appropriate western scientific knowledge for their own benefit – as evidenced by widespread varietal breeding and selection).

A third barrier to the development of a critical consciousness stems from a lack of appreciation of the possible transformative power of local communities. As discussed in the previous section, agroecologically informed practices are not supported by the state, while we can hope that this may not always be the case, it is naïve to assume that productivist policies that have existed for so long will be overturned in the immediate future. As such, it is imperative that local communities use the institutions that they already control to support autochthonous strategies that address the sustainability issues associated with local rice production. Some suggestions as to how this might be achieved have already been made. However, aside from the development of individual critical consciousness there needs to be a focus on collective critical consciousness, i.e. a consciousness that realises that local people have the power to develop innovative forms of social organisation that support agroecological practices. Just as individual innovation is important for the development of agroecological practices, social innovation is required to provide support for those practices.

The barriers to the social innovation described above have been discussed at length in the previous section, and include the persistence of patrimonial ties, and the very important local conception that those with wealth and power (i.e. machinery) are somehow better suited to govern than those without. This conception is deeply cultural embedded, and is a very significant barrier to the development of a critical consciousness. While barriers such as these may seem far removed from actual agricultural practice, I hope this thesis has shown that this is not the case at all, and that what is required is the transformation from farmers as objects of agricultural development initiatives to farmers (and their communities) as transformative agents, with the power to shape their own reality.

11.4 Concluding Remarks

Through its discussion of the necessary and sufficient conditions for sustainable rice production in the barangay of Campagao, this thesis has raised a number of issues about the impact of mainstream agricultural development strategies on resource poor farmers. In particular it has examined the ways in which farmers adapt to agricultural development initiatives, the need to integrate social transformative concepts into the agroecological perspective, and the need to place more emphasis on the linking of social and ecological systems for agricultural sustainability.

This case study highlighted the lack of opportunities available to resource poor farmers in Campagao to improve their well being through the production of rice within the current social, economic and political context. The study has highlighted the reactive, survival orientated rice production strategies employed by these farmers, strategies which are the antithesis of the productivist agenda of the NGP, and which, from a sustainability perspective, may be degrading the very resource base upon which production depends, particularly soil fertility. This thesis has demonstrated how the agricultural development initiatives of the NGP have had no beneficial affects in the lives of resource poor farmers over the last 30 years. With average yields, amongst the most resource poor farmers, remaining essentially the same as those achieved during the kinaraan period, but with the added burdens of costly high input expenses, and an accelerated degradation of the agricultural resource base, many farmers are worse off.

Unfortunately, for a number of reasons, the alternative agricultural development initiative promulgated under the SEARICE–CFPRA partnership has had minimal effect across the barangay, with only three farmers (out of the 26 CFPRA members) managing to make the transition to organic farming methods. While the development of seed varieties and their spread has been a very important initiative, helping many farmers maintain production levels, sustainability initiatives that rely upon new and persistent modes of cooperation (e.g. sourcing organic fertiliser) have been unsuccessful. Indeed a form of dependency has been created between CFPRA and SEARICE which has acted to stifle the development of incipient institutions which could support such initiatives.

This thesis suggests that ecologically informed agricultural development initiatives, while being necessary conditions for sustainability, are not in themselves sufficient. Such technologies need to be supported by institutions (i.e. forms of organisation at various levels) that support the development, spread and operationalisation of these technologies within particular social contexts. While there is a technocentric focus within mainstream agricultural development - as evidenced in the Philippines by the primacy placed on hybrid rice varieties and inorganic fertiliser – I think the same can be said for alternative agricultural development strategies that ignore the social mechanisms that can support ecological approaches.

This thesis suggests that ecological approaches to agricultural development problems will fail in exactly the same way that more reductionist-technological approaches to agricultural development will fail, if the requisite supporting institutions at various levels are not in place. This is where, I believe, the field of agroecology needs to move. This thesis implies that the application of ecological principles to agricultural production is, in some respects, the easy aspect of an agroecological approach to agricultural development. The difficulty is in linking such practices with persistent, socially embedded institutions which support the operationalisation of such practices, and the development of new practices. This focus on eco-social adaptation should, in my opinion, be the primary focus of agroecology. It makes little sense to develop ecologically-informed practices if the institutional support for those practices does not exist, or is inadequate. If agroecological practices are to benefit large numbers of farmers (not just the lucky few) then these practices need to be sustainable within the context of local social practice.

It is imperative that agroecologically-informed agricultural development initiatives don't suffer from the same context-independent prescriptions that characterise more mainstream approaches to agricultural development. The negative impacts of which were discussed at length in chapter 5. Agroecology needs a conceptual framework that helps integrate the important issues of power, social structure, culture and knowledge with the broader concern of applying ecological principles to agricultural problems. This does not presently exist in any explicit form. The principles underlying TPD, developed and discussed at length throughout this thesis, may provide a way forward in this regard.

The social transformative concepts underlying the TPD approach allow not only for the analysis of local barriers to the realisation of more sustainable practices, but also provide a tool for ascertaining a way forward, both within the local context and in broader political and social contexts. In fact, this thesis suggests that, considering the marginalisation of resource poor farmers, these broader contexts, which in the Philippines include national agricultural development policy, land reform and legislation, can only be transformed through the political engagement of farmers at a local level.

If agroecologically-informed approaches are to compete with the dominance of more reductionist approaches then transformation will be required at many levels. While the case study presented in this thesis focussed on one agroecosystem level (i.e. household level rice production), the transformative concepts developed in this thesis can be applied at any agroecosystem level (including the national level of agricultural development policy). If agroecological approaches are to be scaled up then the higher level political, social, economic and epistemological barriers to the operationalisation of such approaches need to be overcome. These are many and varied, and may include epistemological issues such as the way plant breeders and agricultural extension workers discount the valid [scientific] knowledge of farmers ("farmers don't breed rice"), or the way we think about breeding crop plants; for example, should we focus on genetic heterogeneity, and let farmers experiment further with these varieties? At the level of national rice production, policy makers need to accept that their technological prescriptions are not working in marginal areas, or for those farmers who are resource poor, and they need to rethink the productivist agenda that underlines much contemporary agricultural development policy. Further research needs to be undertaken at various agroecosystem levels, e.g. crop agroecosystem, household, community, regional, and national levels, into the ways in which ecological principles, and the social mechanisms to support such principles can be integrated at various scales.

This thesis implies that sustainable agricultural development is not a simple process, nor can it be considered in isolation from other issues such as governance, representative democracy, conflict, education, or institution building, as these issues affect the broader social and political contexts within which agricultural development takes place. If the future needs of the millions of resource poor farmers around the world are to be met, then decision makers need to recognise that the technological transformation of the countryside will not be sufficient, what is required is a genuine commitment to the social and political transformation of the conditions which inhibit sustainable agricultural practices.

References

Agarwal, A. (1995) "Dismantling the divide between indigenous and scientific knowledge", *Development and Change* 26: 413-439

Allen, P. (1993) "Connecting the Social and the Ecological in Sustainable Agriculture", in Allen, P (ed) *Food for the Future: Conditions and Contradictions of Sustainability,* New York: Wiley and Sons

Allen, P., and C. Sachs (1991) "What do we want to sustain? Developing a comprehensive vision of sustainable agriculture", *Sustainability in the Balance,* Agroecology program, University of California, Santa Cruz

Altieri, M. (1988) "Beyond agroecology: making sustainable agriculture part of a political agenda", *American Journal of Alternative Agriculture,* Vol 3(4): 142-143

Altieri, M. (1993) "Ethnoscience and biodiversity: key elements in the design of sustainable pest management systems for small farmers in developing countries", *Agriculture, Ecosystems and Environment,* 46:257-272

Altieri, M. (1995) *Agroecology: The Science of Sustainable Agriculture,* 2nd edition, Boulder, Colorado: Westview Press

Altieri, M. (2002) "Agroecological Principles for Sustainable Agriculture", in Uphoff, N. (ed) *Agroecological Innovations,* London: Earthscan

Altieri, M. and C.I. Nicholls (1999) "Biodiversity, ecosystem function and insect pest management in agricultural systems", in Collins, W.W. and C.O. Qualset (eds) *Biodiversity in Agroecosystems,* Boca Raton, FL: CRC Press

Altieri, M., Rosset, P.M, and C.I. Nicholls (1997) "Biological control and agricultural modernization: Towards a resolution of some contradictions", *Agriculture and Human Values,* 14: 303-310

Amador, M.F., and S.R. Gliessman (1990) "An Ecological Approach to Reducing External Inputs Through the Use of Intercropping", in Gliessman, S.R (ed) Gliessman, S.R (ed) (1990) *Agroecology: Research the Ecological Basis for Sustainable Agriculture,* New York: Springer-Verlag

Amin, S. (1997) *Capitalism in the Age of Globalisation,* London: Zed Press

Anderson, R.S., Levy, E., and B.M. Morrison. (1991) *Rice Science and Development Politics,* Oxford: Clarendon Press

Angeles, L.C. (1999) "The Political Dimension in the Agrarian Question: Strategies of Resilience and Political Entrepreneurship of Agrarian Elite Families in a Philippine Province", *Rural Sociology,* 64(4): 667-692

Apalisok, S.M. (1992) *Bohol Without Tears, Book 2: Bohol's 47 Towns and One City*, Manila, Philippines: self published

APC (1986[a]) *APC Technical News, No.2.* Agricultural Promotion Centre, Philippines Department of Agriculture, Tagbilaran City, Bohol.

APC (1986[b]) *APC Technical News, No. 3.* Agricultural Promotion Centre, Philippines Department of Agriculture, Tagbilaran City, Bohol.

APC (1989) *APC Technical News,* Agricultural Promotion Centre, Philippines Department of Agriculture, Tagbilaran City, Bohol.

Aristotle (1976) *The Nicomachean Ethics,* Harmondsworth: Penguin

Avery, D. (1995) *Saving the Planet with Pesticides and Plastic: The Environmental Triumph of High Yield Farming,* Indianapolis, IN: Hudson Institute

Balisacan, A.M. (1998) "Policy Reforms and Agricultural Development in the Philippines" *ASEAN Economic Bulletin,* Vol 1. No.15: 77-89

Barker, R., Herdt, R.W., and B. Rose. (1985) *The Rice Economy of Asia.* Manila: International Rice Research Institute

Barrows, H.H. (1923) "Geography as human ecology" *Annals of the Association of American Geographers,* 13(1):1-4

BAS (2002) Bohol rice yield data, Philippine Bureau of Agricultural Statistics, Tagbilaran City, Bohol

Barzman, M., and S. Desilles (2002) "Diversifying Rice-based Farming Systems and Empowering Farmers in Bangladesh Using the Farmer Field-school Approach" in, Uphoff, N. (ed) (2002) *Agroecological Innovations: Increasing Food Production with Participatory Development,* London: Earthscan

Bauer, P. (1972) *Dissent on Development,* London: Weidenfeld and Nicholson

Bautista, M.C.R.B. (1983) *Capitalism and the Social Differentiation of the Philippine Peasantry,* PhD Thesis, The University of Wisconsin-Madison

Bautista, R.M. (1997) "Income and Equity Effects of the Green Revolution in the Philippines: A Macroeconomic Perspective", *Journal of International Development,* Vol.9, No.2: 151-168

Bebbington, A. (1991) "Indigenous agricultural knowledge systems, human interests, and critical analysis: Reflections on farmers organization in Ecuador", *Agriculture and Human Values,* 18(1-2): 14-24

Bellon, M.R. (1997) *On –farm conservation as a process: an analysis of its components*, in, Sperling, L., and M. Loevinsohn (eds) *Using diversity: enhancing and maintaining genetic resources on-farm.* International Development Research Centre

Berkes, F. and C. Folke (eds) (1998) *Linking Social and Ecological Systems: Management Practices and Social Mechanisms for Building Resilience*, Cambridge: Cambridge University Press

Berman, S. (1997) "Civil society and political institutionalisation", *American Behavioural Scientist*, 40(5): 562-574

Bernstein, H. (1990) "Agricultural Modernization and the Era of Structural Adjustment: Observations on Sub-Saharan Africa", *Journal of Peasant Studies*, 18(1): 3-35

Berthoud, G. (1992) "Market", in, W. Sachs (ed) *The Development Dictionary*, London: Zed Books

Bertuso, A. R. (2000) *Farmer's Management of Rice Genetic Diversity: A Study on Enhancing Red Rices in Bohol, Philippines*, Unpublished Masters Thesis, Wageningen University, The Netherlands

Bilar Local Government Unit (2002) *Bilar Comprehensive Land Use Plan*, Municipal Government of Bilar, Poblacion, Bilar, Bohol

Black, J.K. (1992) *Development in Theory and Practice*, Oxford: Westview Press

Bookman, A., and S. Morgen (1988) *Women and the politics of empowerment*, Philadelphia: Temple University Press

Boratav, K., Turel, O., and E. Yeldan (1996) "Dilemma's of Structural Adjustment and Environmental Policies under Instability: Post 1980 Turkey", *World Development*, 24(2): 373-393

Borden, R.J. (1985) "Technology, Education and the Human Ecological Perspective", *The Journal of Environmental Education*, Vol. 16(3): 1-5

Borras Jr, S.M. (2001) "State – Society Relations in Land Reform Implementation in the Philippines", *Development and Change*, Vol.32: 531-561

Borras Jr, S.M. (2002) *Stuck in the Mud: Land Reform under the Macapagal-Arroyo Administration*, retrieved from http://www.philsol.nl/A02a/Borras-AR2002-apr02.htm, on 19th November, 2003

Borromeo, T., and J. Hernandez. (1987) *Philippine rice genetic resources: Status, problems and prospects.* Philippine National Conference on Genetic Resources and Development, September 1987, Tagaytay, Philippines

Bourdieu, P. (1986) "The Forms of Capital", in, Richardson, J (ed) *Handbook of Theory and Research for the Sociology of Education*, New York: Greenwood Press

Boyce, J.K. (1993) *The Political Economy of Growth and Impoverishment in the Marcos Era*, Manila: Ateneo de Manila University Press

Boyden, S. (1981) *The Ecology of a City and its People*, Canberra: ANU Press

Boyden, S. (1986) "And Integrative Approach to the Study of Human Ecology" in, Borden, R.J., Jacobs, J, and G.L. Young (eds) *Human Ecology: A Gathering of Perspectives*, College Park, Maryland: The Society for Human Ecology

Brohman, J. (1995) "Universalism, Eurocentrism and ideological bias in development studies: from modernisation to neoliberalism", *Third World Quarterly*, Vol 16 (1)

Brokensha, D., Warren, D., and O. Werner (eds) (1980) *Indigenous Knowledge Systems and Development*, Lanham: University Press of America

Buresh, R.J., and S.K. De Datta (1990) "Denitrification losses from puddled rice soils in the tropics", *Biology, Fertility, Soils*, 9(1-13)

Buttel, F.H. (1993) "The production of agricultural sustainability: Observations from the sociology of science and technology", in Allen, P (ed) *Food for the Future: Conditions and Contradictions of Sustainability*, New York: Wiley and Sons

Cabunagan, R.C., Castilla, N., Coloquio, E.L., Tiongco, E.R., Truong, X.H., Fernandez, J., Du, M.J., Zaragosa, B., Hozak, R.R., Savary, S., and O. Azzam. (2001) "Synchrony of planting and proportions of susceptible varieties affect rice tungro disease epidemics in the Philippines", *Crop Protection*, 20: 499-510

Carroll, C. R., Vandermeer, J.H., and P.M. Rosset (1990) *Agroecology*, New York: McGraw-Hill Publishing Company

Cassman, K.G., Kropff, M.J., Gaunt, J., and S. Peng (1993) "Nitrogen use efficiency of rice reconsidered: what are the key constraints?", *Plant Soil*, 155-156: 359-362

Cassman, K.G., and P.L. Pingali (1995) "Extrapolating trends from long term experiments to farmers' fields: the case of irrigated rice systems in Asia", in, Barnett, V., Payne, R., and R. Steiner (eds) *Agricultural Sustainability: Economic, Environmental and Statistical Considerations*, London: John Wiley and Sons

Cassman, K.G., De Datta, S.K., Amarante, S., Liboon, S., Samson, M.I., and M.A. Dizon (1996) "Long term comparison of agronomic efficiency and residual benefits of organic and inorganic nitrogen sources for tropical lowland rice", *Experimental Agriculture*, 32: 427-444

CBDC (2001[a]) *A Study on Plant Genetic Resources, Diversity and Seed Supply System of Bohol Island, Philippines.* Technical Report No. 1. Southeast Asian Regional Initiative for Community Empowerment, Quezon City, Philippines

CBDC (2001[b]) *Development of Farmers' Rice Selections in Bohol, Philippines.* Technical Report No. 5, Southeast Asia Regional Initiative for Community Empowerment, Quezon City, Philippines

Cerutti, M. (2000) "Economic Reforms, Structural Adjustment and Female Labour Force Participation in Buenos Aires, Argentina", *World Development,* 28(5): 879-891

Chambers, R. (1983) *Rural Development: Putting the last first,* London: Longman

Chambers, R. (1994) "Participatory Rural Appraisal: Analysis of Experience", *World Development* 22 (9): 1253-1268

Chambers, R. (1997) *Whose Reality Counts? Putting the first last.* London: Intermediate Technology Publications

Chirino, P. (1604) [1904] "Relation de las Islas Filipinas", in Blair, E., and J. Robertson (trans.) (1904), *The Philippines Islands* 1493-1898, Vol 28: 325-329, Cleveland: Arthur H. Clark Co.

Chossudovsky, M. (1997) *The Globalisation of Poverty,* Manila: Third World Network

Cleaver, F. (1999) "Paradoxes of Participation: Questioning Participatory Approaches to Development", *Journal of International Development,* 11: 597-612

Cleaver, H. (1973) "The contradictions of the Green Revolution.", in Wilber, C.K (ed) *The Political Economy of Development and Underdevelopment,* New York: Random House

Cleveland, D.A. and S.C. Murray (1997) "The world's crop genetic resources and the rights of indigenous farmers", *Current Anthropology,* 38 (4): 477-515

Coleman, J. (1988) "Social Capital in the Creation of Human Capital", *American Journal of Sociology,* Vol 94: S95-S120

Constantino, R. (1975) *The Philippines: A Past Revisited,* Quezon City: Tala Publishing

Conway, G. (1985) "Agroecosystem analysis", *Agricultural Administration,* 20: 31-55

Conway, G. (1987) "The Properties of Agroecosystems", *Agricultural Systems,* 24: 95-117

Cornia, G. (2001) "Social Funds in Stabilisation and Adjustment Programs: A Critique", *Development and Change,* 32(1): 1-32

Cornwall, A. (1998) "Gender, participation and the politics of difference", in, Guijt, I, and M. Kaul Shah (eds) *The myth of community: Gender issues in participatory development,* London: Intermediate Technology Publications

Cornwall, A. (2003) "Whose Voices? Whose Choices? Reflections on Gender and Participatory Development", *World Development* 30(8): 1325-1342

Cornwall, A., and S. White (eds) (2000) "Men, masculinity and development: politics, policies and practice", *IDS Bulletin* 31(2)

Corpuz, O.D. (1957) *The Bureaucracy in the Philippines,* Quezon City: Institute of Public Administration, University of the Philippines, cited in, Quah, J.S.T. (1999) "Corruption in Asian Countries: Can it be Minimised?" *Public Administration Review,* November/December 1999, Vol 59, No. 6: 483-494

Cowen, M.P., and R.W. Shenton (1996) *Doctrines of Development,* London: Routledge

Crippen, H.R. (1946) "Philippine Agrarian Unrest", *Science and Society,* 10: 337-360

Cromwell, E. (1999) *Agriculture, Biodiversity and Livelihoods: Issues and Entry Points.* London: Overseas Development Institute

Danermark, B., Ekström, M., Jakobsen, L., and J. Ch. Karlsson (1997) *Explaining Society: Critical realism in the social sciences,* London and New York: Routledge

Das, R. (1998) "The Green Revolution, Agrarian productivity and labor", *International Journal of Urban and Regional Research,* 22(1): 122-135

Dasgupta, B. (1998) *Structural Adjustment, Global Trade, and the New Political Economy of Development,* New Delhi: Vistaar

David, C., V. Cordova, and K. Otsuka (1994). "Technological change, land reform, and income distribution in the Philippines." In C. David and K. Otsuka (eds.), *Modern Rice Technology and Income Distribution in Asia* (pp. 51-106). Boulder, Colorado: L. Reinner

De Datta, S.K., Gomez, K.A., and J. Descalsota (1988) "Changes in yield response to major nutrients and in soil fertility under intensive rice cropping", *Soil Science,* 146: 350-358

Deininger, K., Lara Jr, F., Maertens, M., and A. Quisumbing (1999) *Agrarian Reform in the Philippines: Past Impact and Future Challenges,* World Bank, Washington DC, *mimeo,* retrieved on 17/11/03 from http://orion.forumone.com/gdnet/files.fcgi/189_final4.PDF

Docherty, J. (1982) "Who controls the Philippine Economy?' in B. Aquino (ed) *Cronies and Enemies: The Current Philippine Scene,* Honolulu, Hi: Centre for Asian and Pacific Studies, University of Hawaii, quoted in M. Turner (1984) "The political economy of the Philippines: critical perspectives", *Pacific Review,* 57(3): 467-468

Douglass, G.K. (ed) (1984) *Agricultural Sustainability in a Changing World Order,* Boulder, Colorado: Westview Press

Dove, M.R., and D.M. Kammen (1997) "The Epistemology of Sustainable Resource Use: Managing Forest Products, Swiddens, and High-Yielding Variety Crops", *Human Organization,* Vol. 56, No. 1:91-101

Edwards, B., and M.W. Foley (1997) "Social capital and the political economy of our discontent", *The American Behavioural Scientist,* 40(5): 669-678

Edwards, B., and M.W. Foley (1998) "Civil society and social capital beyond Putnam" *The American Behavioural Scientist,* 42(1): 124-139

Escobar, A. (1992) "The making and unmaking of the third world through development", in Rahena, M., and V. Bawtree (eds) *The Post-Development Reader,* London: Zed Books

Esteva, G. (1992) "Development", in, W. Sachs (ed) *The Development Dictionary,* London: Zed Books

Estudillo, J.P., Quisumbing, A. R., and Otsuka, K. (2001) "Income and distribution in rice-growing villages during the post-Green Revolution periods: the Philippine case, 1985 and 1998", *Agricultural Economics,* 25: 71-84

FAO (1996) *Report on the State of the World's Genetic Resources for Food and Agriculture,* Technical Conference on Plant Genetic Resources, Leipzig Germany, 17-23 June 1996, Plant Production and Protection Division, Food and Agriculture Organisation, Rome

FAO (1997) "Trends of yield and productivity of modern rice in irrigated rice systems", *International Rice Commission Newsletter,* 46: 19-25

FAO (2000) *FAO Rice Information,* Volume 2, January 2000, retrieved from http://www.fao.org/WAICENT/FAOINFO/AGRICULT/AGP/AGPC/doc/riceinfo/Riceinfo.htm, on 1/6/04

FAO (2002) *World Agriculture: Towards 2015/2030,* United Nations Food and Agriculture Organisation, retrieved from, http://fao.org/docrep/004/y3557e/y3557e11.htm, on 27/9/04

FAOSTAT (2004) *FAO Statistical Database,* retrieved from http://faostat.fao.org/faostat/default.jsp?language=EN&version=ext&hasbulk, on 1/6/04

Feder, E. (1983) *Perverse Developmen,.* Quezon City: Foundation for Nationalist Studies

Fegan, B. (1979) *Folk-Capitalism: Economic Strategies of Peasant in a Philippine Wet-Rice Village,* Unpublished PhD thesis, Yale University, Department of Anthropology

Fernandes, E., Pell, A., and N. Uphoff (2002) "Rethinking Agriculture for New Opportunities", in Uphoff, N. (ed) *Agroecological Innovations,* London: Earthscan

Fine, B. (2002[a]) "Economics Imperialism and the New Development Economics as Kuhnian Paradigm Shift?", *World Development,* 30(12): 2057-2070

Fine, B. (2002[b]) *Neither the Washington Nor the Post-Washington Consensus: An Introduction,* International Development Economic Associates, electronic resource, retrieved from http://networkideas.org, 31/03/04

Flinn, J.C., and S.K. DeDatta (1984) "Trends in irrigated rice yields under intensive cropping at Philippine research stations", *Field Crops Research,* 9: 1-15

Flyvberg, B. (2001) *Making Social Science Matter: why social inquiry fails and how it can succeed again,* Cambridge: Cambridge University Press

Foley, M.W., and B. Edwards (1999) "Is It Time to Disinvest in Social Capital?", *Journal of Public Policy,* 19(2): 141-173

Forde, C. Daryll (1934) *Habitat, Economy and Society: A Geographical Introduction to Ethnology,* London and New York

Fox, J. (1997) "The World Bank and Social Capital: Contesting the Concept in Practice", *Journal of International Development,* 9(7): 963-971

Francis, P. (2001) "Social Capital, Social Exclusion and Civil Society", in, Kothari, U. and M. Minogue (eds) *Development Theory and Practice: Critical Perspectives,* London: Palgrave

Frederick, L.J. and R.J.G. Wells (1978) "Some Aspects of Tenancy Reform Measures in the Southeast Asia", *Asian Survey,* Vol 18, Issue 6: 644-658

Freire, P. (1970) *Pedagogy of the oppressed,* London: Penguin

Friedmann, H. (1993) "After Midas's Feast: Alternative Food Regimes for the Future, in Allen, P (ed) *Food for the Future: Conditions and Contradictions of Sustainability,* New York: Wiley and Sons

Frossard, D. R (1994) *Peasant Science: farmers Research and Philippine Rice Development,* unpublished PhD thesis, University of California, Irvine

Fujisaka, S. (1994) "Were farmers wrong in rejecting a recommendation? The case of nitrogen at transplanting for irrigated rice" *Agricultural Systems,* 43: 271-286

Fujisaka, S. (1999) *Side-stepped by the Green Revolution: Farmers traditional rice cultivars in the uplands and rainfed lowlands,* in, Prain, G., S. Fujisaka., and M.D. Warren. (eds) *Biological and Cultural Diversity: The role of indigenous agricultural experimentation in development.* Intermediate Technology Publications

Gamble, A. (2001) "Neo-Liberalism", *Capital and Class* (75): 127-134

Gaventa, J. (2003) "Towards Participatory Local Governance: Assessing the Transformative Possibilities", *Conference on Participation: From Tyranny to Transformation,* Manchester, 27-28 February, 2003, electronic resource, retrieved from http://idpm.man.ac.uk/rsc/events/participation03/index.shtml, on 5/04/04

Gaventa, J. and C. Valderrama (1999) "Participation, Citizenship and Local Governance – background paper", Conference: *Strengthening Participation in Local Governance,* Brighton: Institute of Development Studies, electronic resource, retrieved from http://www.ids.ac.uk/ids/particip/research/localgov.html, on 4/04/04

Geske-Dijkstra, A. (1996) "The Impact of Structural Adjustment Programs on Manufacturing: Lessons from Nicaragua", *World Development*, 24(3): 535-547

Glaser, B. (1995) *Environment, Development, Agriculture*, London: UCL Press Ltd

Gliessman, S.R (ed) (1990) *Agroecology: Research the Ecological Basis for Sustainable Agriculture*, New York: Springer-Verlag

Gliessman, S. R. (1998) *Agroecology*, Chelsea: Ann Arbour Press

Goodman, D. (2000) "Organic and conventional agriculture: Materializing discourse and agro-ecological managerialism", *Agriculture and Human Values*, 17: 215-219

Goodman, D., Sorj, B., and J. Wilkinson (1987) *From Farming to Biotechnology*, Oxford: Blackwell

Gore, C. (1999) "The Rise and Fall of the Washington Consensus as a Paradigm for Developing Countries", *World Development*, 28(5): 789-804

GPEP (1996) *Gintong Ani*, Grains Production and Enhancement Program, Agricultural Promotion Centre, Tagbilaran City, Bohol

Granovetter, M. (1973) "The Strength of Weak Ties", *American Journal of Sociology*, Vol 78: 1360-1380

Greeley, A. (1997) "Coleman revisited: Religious structures as a source of social capital", *The American Behavioural Scientist*, 40(5): 587-594

Guba, E.G. (1990) The Alternative Paradigm Dialog, in, Guba, E.G (ed) *The Paradigm Dialog*, Newbury Park: Sage

Guijt, I., Kisadha, T., and G. Musaka (1998) "Agreeing to disagree: dealing with age and gender in Redd Barna Uganda", in, Guijt, I, and M. Kaul Shah (eds) *The myth of community: Gender issues in participatory development*, London: Intermediate Technology Publications

Guthman, J. (2000) "Raising organic: An agro-ecological assessment of grower practices in California", *Agriculture and Human Values*, 17: 257-266

Gutierrez, E. (1992) *All in the Family: A Study of Elites and Power Relations in the Philippines*, Quezon City: Institute for Popular Democracy

Handa, S., and D. King (2003) "Adjustment with a Human Face? Evidence from Jamaica", *World Development*, 31(7): 1125-1145

Harlan, J.R. (1975) "Our vanishing genetic resources." *Science* 188: 618-621.

Harriss, J. (2000) "How much difference does politics make? Regime differences across Indian states and rural poverty reduction", *LSE Working Paper Series No 1*, retrieved from www.lse.ac.uk on 23rd July 2004

Harriss, J., and P. De Renzio (1997) "'Missing Link' or 'Analytically Missing'?: The Concept of Social Capital", *Journal of International Development*, 9(7): 919-937

Hart, R.D. (1986) "Ecological framework for multiple cropping research", in, Francis, C.A (ed) *Multiple Cropping Systems*, New York: MacMillan

Harwood, R.R. (1979) *Small Farm Development – Understanding and Improving Farming Systems in the Humid Tropics*, Boulder: Westview Press

Hawes, G. (1990) "Theories of Peasant Revolution: A Critique and Contribution from the Philippines", *World Politics*, Volume 42, Issue 2: 261-298

Haynes, J. (1996) *Third World Politics: a concise introduction*, Cambridge, Mass: Blackwell

Hecht, S. B. (1995) "The Evolution of Agroecological Thought", in Altieri, M. (ed) *Agroecology: The Science of Sustainable Agriculture*, second edition, Boulder, Colorado: Westview Press

Hendrix, P.F., Crossley, D.A Jr., Blair, J.M., and D.C Coleman (1990) "Soil biota as components of sustainable agroecosystems", in Edwards, C.A., Lal, R., Madden, P., R.H, Miller., and G. House (eds) *Sustainable Agricultural Systems*, Iowa: Soil and Water Conservation Society

Herdt, R. (1987) "A Retrospective View of Technological and Other Changes in Philippine Rice Farming, 1965-1982", *Economic Development and Cultural Change*, 35 (2): 64-85

Hettne, B. (1995) *Development theory and the three worlds: Towards an international political economy of development*, Essex: Longman Scientific and Technical

Hickey, S., and G. Mohan (2003) "Relocating participation within a radical politics of development: citizenship and critical modernism", *Conference on Participation: From Tyranny to Transformation*, Manchester, 27-28 February, 2003, electronic resource, retrieved from http://idpm.man.ac.uk/rsc/events/participation03/index.shtml, on 5/04/04

Hirtz, F. (1998) "The Discourse that Silences: Beneficiaries' Ambivalence Towards Redistributive Land Reform in the Philippines", *Development and Change*, Vol. 29: 247-275

Hollnsteiner, M.R. (1963) *The Dynamics of Power in a Philippine Municipality*, Quezon City: Community Development Research Centre, University of the Philippines

Hopper, W.D. (1968) "Investment in Agriculture: The Essentials for Payoff", in *Strategy for the Conquest of Hunger: Proceedings of a Symposium Convened by the Rockerfeller Foundation, April 1 and 2, 1968, at the Rockerfeller University.* New York: Rockerfeller Foundation pp 102-13, cited in, Boyce, J.K. (1993) *The Political Economy of Growth and Impoverishment in the Marcos Era,* Manila: Ateneo de Manila University Press

Hossain, M. (1996) "Recent Developments in the Asian Rice Economy: Challenges for Rice Research", in Evenson, R.E., Herdt, R.W. and M. Hossain (eds) *Rice Research in Asia: Progress and Priorities.* Wallingford: CAB International

Hossain, M., and P. L. Pingali (1998) "Rice research, technological progress, and the impact on productivity: an overview" in, Hossain, M. and P.L. Pingali (eds) *Impact of Rice Research.* Proceedings of the International Conference on the Impact of Rice Research, 3-5 June, 1996, Bangkok, Thailand. Thailand Development Research Institute, Bangkok, Thailand, and International Rice Research Institute, Los Banos, Philippines

Hossain, M., Gascon, F.B. and I.M. Revilla (1996) "Constraints to Rice Production in the Philippines", in Evenson, R.E., Herdt, R.W. and M. Hossain (eds) *Rice Research in Asia: Progress and Priorities.* Wallingford: CAB International

IRRI (1985) *International Rice Research: 25 Years of Partnership,* Los Banos, Philippines

Janssens, M.J.J., Neumann, I.F., and L. Froidevaux (1990) "Low-Input Ideotypes", in Gliessman, S.R (ed) *Agroecology: Research the Ecological Basis for Sustainable Agriculture,* New York: Springer-Verlag

Kaimowitz, D., Thiele, G., and P. Pacheco (1999) "The Effects of Structural Adjustment on Deforestation and Forest Degradation in Lowland Bolivia", *World Development,* 27(3): 505-520

Kenmore, P.E (1991) *How rice farmers clean up the environment, conserve biodiversity, raise food, make higher profits, Indonesia's IPM – A model for Asia,* Food and Agriculture Organisation of the United Nations, Manila, Philippines

Kenmore, P.E., Carino, F.O., Perez., C.A., Dyck, V.A., and A.P. Gutierrez (1984) "Population regulation of the brown planthopper within rice fields in the Philippines", *Journal of Plant Protection in the Tropics,* 1(1): 19-37

Kerkvliet, B, J. (1974) "Land Reform in the Philippines since the Marcos Coup", *Pacific Affairs,* Volume 47, Issue 3: 284-304

Kerkvliet, B, J. (1977) *The Huk Rebellion: A Study of Peasant Revolt in the Philippines,* Berkeley: University of California Press

Kerkvliet, B, J. (1995) "Toward a More Comprehensive Analysis of Philippine Politics: Beyond the Patron-Client Factional Framework", *Journal of Southeast Asian Studies* 26, 2: 401-419

Khush, G.S (1996) "Prospects of and approaches to increasing the genetic yield potential of rice", in, Evenson, R.E., Herdt, R.W., and M. Hossain (eds) *Rice Research in Asia: Progress and Priorities*, Oxford: CAB International

Kirchhof, G., Priyono, S., Utomo, W.H., Adisarwanto., Dacanay, E.V., and H.B. So (2000) "The effect of soil puddling on the soil physical properties and the growth of rice and post-rice crops", *Soil and Tillage Research*, 56: 37-50

Kloppenburg, J. (1991) "Alternative agriculture and the new biotechnologies", *Science as Culture*, Vol 2, Part 4

Kloppenburg, J. (1991) "Social theory and the de/reconstruction of agricultural science: Local Knowledge(s) for an alternative agriculture" *Rural Sociology* 56(4): 519-548

Koppel, B., and E. Oasa (1987) "Induced innovation Theory and Asia's Green Revolution: A Case Study of an Ideology of Neutrality", *Development and Change*, Vol 18: 29-67

Kothari, B. (2002) "Theoretical streams in Marginalized Peoples' Knowledge(s): Systems, asystems, and Subaltern Knowledges", *Agriculture and Human Values* 19:225-237

Kowalewski, D. (1992) "Counterinsurgent Paramilitarism: A Philippine Case Study", *Journal of Peace Research*, Vol. 29, Issue 1: 71-84

Krishna, A. (2001) "Moving from the Stock of Social Capital to the Flow of Benefits: The Role of Agency", *World Development*, 29(6): 925-943

Kropff, M.J., Cassman, K.G., vanLaar, H.H., and S. Peng (1993) "Nitrogen and yield potential of irrigated rice", *Plant Soil*, 155-156: 391-394

Kundu, D.K., and J.K Ladha (1995) "Efficient management of soil and biologically fixed N_2 in intensively cultivated rice fields", *Soil Biology and Biochemistry*, 27:431-439

Kundu, D.K., and J.K. Ladha (1999) "Sustaining productivity of lowland rice soils: issues and options related to N availability", *Nutrient Cycling in Agroecosystems*, 53: 19-33

Lal, D. (1983) *The Poverty of Development Economics*, London: Institute for Economic Affairs

Lall, S. (1995) "Structural Adjustment and African Industry", *World Development*, 23(12): 2019-2031

Lande, C. (1965) *Leaders, Factions, and Parties: The Structure of Philippine Politics*, New Haven: Southeast Asia Studies, Yale University

Leal, P. (1999) "Participation, communication and technology in the age of the global market", *Forests, Trees and People Newsletter*, 40/41: 4-8

Liebman, M. (1995) "Polyculture Cropping Systems", in Altieri, M (ed) Altieri, M. (1995) *Agroecology: The Science of Sustainable Agriculture,* second edition, Boulder, Colorado: Westview Press

Lister, R. (1997) *Citizenship: Feminist Perspectives,* New York: New York University Press

Lister, R. (1998) "Citizenship in action: citizenship and community development on Northern Ireland", *Community Development Journal,* 33(3): 226-235

Litsinger, J.A. (1989) "Second generation insect pest problems on high yielding rices", *Tropical Pest Management,* 35: 235-242

Long, N., and M. Villareal (1994) "The interweaving of knowledge and power in development interfaces", in, Scoones, I., and J. Thompson (eds.) *Beyond farmer first: Rural people's knowledge, agricultural research and extension practice.* London: Intermediate Technology Publications

Lowrance, R., Stinner, B.R, and G.S. House (1984) *Agricultural Ecosystems,* New York: Wiley Interscience

Magdoff, F. (1995) "Soil Quality and Management", in Altieri, M. (ed) *Agroecology: The Science of Sustainable Agriculture,* second edition, Boulder, Colorado: Westview Press

Major Religious Superiors (1973) "Summary of a National Survey" mimeographed, 26 November, 1973, p2, quoted in Kerkvliet, B, J. (1974) "Land Reform in the Philippines Since the Marcos Coup", *Pacific Affairs,* Volume 47, Issue 3: 284-304

Maxwell, D. (1999) "The Political Economy of Urban Food Security in Sub-Saharan Africa", *World Development,* 27(11): 1939-1953

Mayoux, L. (1995) "Beyond naivety: women, gender inequality and participatory development", *Development and Change,* 26: 235-258

McLennan, M.S. (1969) "Land Tenancy in the Central Luzon Plain" *Philippine Studies,* Vol. 17, No. 4: 651-682

McLennan, M.S. (1982) "Changing Human Ecology on the Central Luzon Plain: Nueva Ecija, 1705-1939", in McCoy and de Jesus (eds), pp57-90, quoted in Boyce, J.K. (1993) *The Political Economy of Growth and Impoverishment in the Marcos Era,* Manila: Ateneo de Manila University Press

Migdal, J.S. (1988) *Strong Societies and Weak States: State-Society Relations and State Capabilities in the Third World,* Princeton: Princeton University Press

Monbiot, G. (2003) *The Age of Consent: A Manifesto for a New World Order,* London: Flamingo

Moore, M. (2001) "Empowerment at Last?", *Journal of International Development,* 13: 321-329

Moran, J. (1999) "Patterns of corruption and development in East Asia" *Third World Quarterly,* Vol 20, No 3: 569-587

Morin, S.R., M. Calibo., M. Garcia-Belen., J-L. Pham., and F. Palis. (2002) "Natural hazards and genetic diversity in rice" *Agriculture and Human Values* 19: 133-149

Moser, C.M., and C.B. Barrett (2002) "The disappointing adoption dynamics of a yield-increasing, low external-input technology: the case of SRI in Madagascar", *Agricultural Systems,* 76: 1085-1100

Mosley, P. (2001) "Attacking Poverty and the 'Post-Washington Consensus'", *Journal of International Development,* 13: 307-313

Mosse, D. (1995) "Social analysis in participatory rural development" *PLA Notes* No. 24. *Critical Reflections on Practice,* London: IIED, Sustainable Agriculture Program

Munasinghe, M. (1993) "Environmental Issues and Economic Decisions in Developing Countries", *World Development,* 21(11): 1729-1748

Narayan, D. (1999) *Bonds and Bridges: Social Capital and Poverty,* Poverty Group, World Bank, Washington, USA

Narayan, D., Stern, N., and G. Nankani (2002) *Empowerment and poverty reduction: a sourcebook,* Washington: World Bank

Newcombe, K. (1975) "Energy use in the Hong Kong food system", *Agro-ecosystems,* 2, 253-76

Newcombe, K. (1977) "Nutrient flow in a major urban settlement: Hong Kong", *Human Ecology,* 5, 179-208

NSCB (2003) *National Statistical Coordination Board – Subsistence Incidence,* retrieved on 3/12/03, http://www.nscb.gov.ph/stattables/default.asp

Odum, E.P. (1984) "Properties of agroecosystems", in Lowrance, R., Stinner, B.R., and G.J. House (eds) *Agricultural Ecosystems: Unifying Concepts,* New York: Wiley Interscience

Padilla, P. L. (1995) "Low Salary Grades, Income-Augmentation Schemes and the Merit Principle.", in Tapales, P.M., and N.N. Pilar (eds) *Public Administration by the Year 2000: Looking Back into the Future,* Quezon City: College of Public Administration, University of the Philippines, quoted in, Quah, J.S.T. (1999) "Corruption in Asian Countries: Can it be Minimised?" *Public Administration Review,* November/December 1999, Vol 59, No. 6: 483-494

Park, R.E (1936) "Human Ecology", *American Journal of Sociology,* 42:1-15

Park, R.E., and E.W. Burgess (1921) *Introduction to the Science of Sociology*, Chicago

Parkins, C. (2000) *Is there a Post-Washington Consensus?* Conference of Socialist Economists, London July 1-2, 2000

Pastor, Jr, M. (1995) "The Effects of IMF Programs in the Third World: Debate and Evidence from Latin America", in, R. Ayres (ed) *Development Studies: An Introduction Through Selected Readings*, Kent: Greenwich University Press

Patton, M. (1990) *Qualitative Evaluation and Research Methods*, Newbury Park: Sage Publications

Pelagrina, W. (2000) *Biodiversity and the sustainability of rice farming systems, in,* IIRR and ILEIA, *Enhancing sustainability of the rice economy in the Philippines.* Workshop Proceedings. International Institute for Rural Reconstruction, Y.C James Yen Centre, Silang, Cavite, Philippines and Centre for Information on Low External Input and Sustainable Agriculture, Leusden, The Netherlands

Phillips-Howard, K.D. (1985) "The Anthropic Catchment-Ecosystem Concept: an Irish example", *Human Ecology* 13, 209-40

Pieterse, J. N. (1998) "My Paradigm of Yours? Alternative Development, Post-Development, Reflexive Development", *Development and Change*, 29: 343-373

Pingali, P.L., and P.A. Roger (eds) (1995) *Impact of Pesticides on Farmer Health and the Rice Environment*, Norwell, M.A: Kluwer Academic Publishers; and Los Banos, Philippines: International Rice Research Institute

Pingali, P.L., and R.V. Gerpacio (1997) "Living with reduced insecticide use for tropical rice in Asia", *Food Policy*, 22(2): 107-118

Pingali, P.L., Hossain, M., Pandey, S., and L.L. Price (1998) "Economics of nutrient management in Asian rice systems: Towards increasing knowledge intensity", *Field Crops Research*, 56: 157-176

Po, B. (1980) "Rural Organizations and Rural Development in the Philippines: A Documentary Study", in M.S Fernandez (ed) *Rural Organizations in the Philippines*, Manila: Institute of Philippine Culture, Ateneo de Manila University

Portes, A. (1998) "Social Capital: Its origins and applications in modern sociology", *Annual Review of Sociology*, 24: 1-24

Portes, A., and P. Landholt (1996) "Unsolved Mysteries: The Tocqueville Files 2: The Downside of Social Capital", *The American Prospect*, Vol 7 (26), electronic resource, retrieved from www.prospect.org/print-friendly/print/V7/26/26-cnt2.html, on 23/3/2001

PPDO (2000) *Bohol Provincial Profile*, Provincial Planning and Development Office, Bohol Provincial Government, Tagbilaran City, Philippines.

Pretty, J.N. (1995) *Regenerating Agriculture*. London: Earthscan

Pretty, J. (2002) "Social and Human Capital for Sustainable Agriculture", in, Uphoff, N. (ed) *Agroecological Innovations: Increasing Food production with Participatory Development*, London: Earthscan Publishing

Pretty, J., and H. Ward (2001) "Social Capital and the Environment", *World Development*, 29(2): 209-227

Purcell, T. (1998) "Indigenous Knowledge and Applied Anthropology: Questions of Definition and Direction", *Human Organisation*, Vol 57, No. 3: 258-272

Putnam, R. (1993) *Making Democracy Work: Civic Traditions in Modern Italy*, New Jersey, Princeton University Press

Putzel, J. (1992) *A Captive Land: The Politics of Agrarian Reform in the Philippines*, London: Catholic Institute for International Relations. New York: Monthly Review Press

Putzel, J. (1997) "Accounting for the 'dark side' of social capital: reading Robert Putnam on Democracy", *Journal of International Development*, 9(7): 939-949

Quah, J.S.T. (1982) Bureaucratic Corruption in the ASEAN Countries: A Comparative Analysis of Their Anti-Corruption Strategies." *Journal of Southeast Asian Studies*, 13 (1): 153-177

Quah, J.S.T. (1999) "Corruption in Asian Countries: Can it be Minimised?" *Public Administration Review*, November/December 1999, Vol 59, No. 6: 483-494

Qualset, C.O., A. B. Damania, A.C. A. Zanatta, and S.B. Brush (1997). " Locally based crop plant conservation." In N. Maxted, B.V. Ford-Lloyd, and J.G. Hawkes (eds.), *Plant Genetic Conservation: The In Situ Approach* (pp. 160-175)

Quisumbing, M.A. (1987) "The Philippine Food and Nutrition Situation: Trends and Policy Issues", in UPLB Agricultural Policy Working Group, *Policy Issues on Nutrition and Welfare*. Laguna: UPLB, Centre for Policy and Development Studies, quoted in, Boyce, J.K. (1993) *The Political Economy of Growth and Impoverishment in the Marcos Era*, Manila: Ateneo de Manila University Press

Rapley, J. (1996) *Understanding Development*, Colorado: Lynne Reinner Publishers

Reijntjes, C., Haverkort, B., and A. Waters-Bayer (1992) *Farming for the Future: An Introduction to Low – External – Input and Sustainable Agriculture*, London: The Macmillan Press

Riedinger, J.M. (1995) *Agrarian Reform in the Philippines: Democratic Transitions and Redistributive Reform*, Stanford CA: Stanford University Press

Rist, G. (1997) *The History of Development: From Western Origins to Global Faith,* London: Zed Books

Rivera, T.C. (1991) *"Class, the State and Foreign Capital: The Politics of Philippine Industrialisation 1950-1986",* PhD diss., University of Wisconsin, Madison

Rivera, T.C. (1994) "The State, Civil Society and Foreign Actors: The Politics of Philippine Industrialisation", *Contemporary Southeast Asia,* 16(2)

Rivera, T.C. (2002) "Transition pathways and Democratic Consolidation in Post-Marcos Philippines", *Contemporary Southeast Asia,* Vol 24 (3): 466-483

Rocamora, J.E., and C. Conti-Panganiban (1975) *Rural Development Strategies: The Philippine Case,* Quezon City: Institute of Philippine Culture, Ateneo de Manila University

Rola, A.C., and P.L. Pingali (1993) *Pesticides, Rice productivity, and farmers' health – an economic assessment,* World Resources Institute and International Rice Research Institute, Los Banos, Philippines

Röling, N., and J. Jiggins (1998) "The Ecological Knowledge System", in, Roling, N.G., and M.A.E. Wagemakers (eds) *Facilitating Sustainable Agriculture,* Cambridge: Cambridge University Press

Röling, N.G., and M.A.E. Wagemakers (eds) (1998) *Facilitating Sustainable Agriculture,* Cambridge: Cambridge University Press

Röling, N., and E. van der Fliert (1998) "Introducing Integrated Pest Management in Rice in Indonesia: A Pioneering Attempt to Facilitate Large Scale Change", in, Röling, N.G., and M.A.E. Wagemakers (eds) (1998) *Facilitating Sustainable Agriculture,* Cambridge: Cambridge University Press

Rosset, P., Collins, J., and F. Moore Lappe (2000) "Lessons from the Green Revolution: Do We Need New Technology to End Hunger?" *Tikkun,* Vol. 15, No. 2: 52-56

Russell, J. (1996) *Environmental Education in Timber Town,* Unpublished Honours Thesis, Department of Human Ecology, Australian National University

Ruttan, V. (1978) "The International Agricultural Research institute as a source of Agricultural Development", *Agricultural Administration,* 5: 293-308

Rydin, Y., and N. Holman (2004) "Re-evaluating the Contribution of Social Capital in Achieving Sustainable Development", *Local Environment,* Vol 9(2): 117-133

Savory, A. (1999) *Holistic management: A new framework for decision making,* Washington DC: Island Press

Scipes, K. (1999) "Global Economic Crisis, Neoliberal Solutions, and the Philippines", *Monthly Review,* December, 1999: 1-14

Shiva, V. (1991) *The Violence of the Green Revolution.* London: Zed Books

Sidel, J.T. (1997) "Philippine Politics in Town, District, and Province: Bossism in Cavite and Cebu", *Journal of Asian Studies* Vol 56(4): 947-966

Sillitoe, P. (1998) "The Development of Indigenous Knowledge: A New Applied Anthropology", *Current Anthropology*, Vol 39, Issue 2: 223-252

So, H.B., and A.J. Ringrose-Voase (2000) "Management of clay soils for rainfed lowland rice-based cropping systems: an overview", *Soil and Tillage Research*, 56: 3-14

Sörlin, S. (1986) "Human Ecology in the history of ideas: the search for a moral context", in, Borden, R.J., Jacobs, J, and G.L. Young (eds) *Human Ecology: A Gathering of Perspectives*, College Park, Maryland: The Society for Human Ecology

Stiglitz, J.E (1998) *More Instruments and Broader Goals: Moving Towards the Post-Washington Consensus*, WIDER Annual Lectures 2, Helsinki: World Institute for Development Economics Research

Stigter, C.J. (1987) "Traditional manipulation of microclimatic factors: knowledge to be used", *ILEIA Newsletter*, 3(3) 5-6

Sumatra, J. (2002) Provincial Agricultural Officer, Bohol Provincial Agricultural Office, *pers comm.*, 28/10/02

Swaminathan, M.S. (2000) Walking the Tightrope, in, Cadman, H. (ed) *The Food and Environment Tightrope*, Canberra, Australian Centre for International Research

Tabien, R. (2000) *High-Yield Rice production Technologies*, in, IIRR and ILEIA, *Enhancing sustainability of the rice economy in the Philippines.* Workshop Proceedings. International Institute for Rural Reconstruction, Y.C James Yen Centre, Silang, Cavite, Philippines and Centre for Information on Low External Input and Sustainable Agriculture, Leusden, The Netherlands

Tengström, E. (1985) *Human Ecology – A New Discipline? A short tentative description of the institutional and intellectual history of human ecology*, Institutionen För Fredsforskning Och Humanekologi, University of Göteborg

Thomas, A. (2000) "Development as Practice in a Liberal Capitalist World", *Journal of International Development*, 12: 773-787

Thrupp, L. A. (2000) "Linking agricultural biodiversity and food security: the valuable role of agrobiodiversity for sustainable agriculture" *International Affairs* 76 (2) 265-281

Tiongco, M., and D. Dawe (2002) "Long-term evolution of productivity in a sample of Philippine rice farms: Implications for sustainability and future research", *World Development*, 30(5): 891-898

Transparency International (2003) *Global Corruption Report*, Berlin: Transparency International. Retrieved from http://www.globalcorruptionreport.org/ on November 5, 2003

Umehara, H. (1983) "Green Revolution for Whom?" in Ledesma, A.J., Makil, P.Q., and V.A. Miralao, *Second View from the Paddy*, Institute of Philippine Culture, Ateneo de Manila University

UNDP (1997) *Human Development Report*, New York: Oxford University Press

Uphoff, N. (ed) (2002) *Agroecological Innovations: Increasing Food Production with Participatory Development*, London: Earthscan

Urich, P. (1989) "Tropical Karst Management and Agricultural Development: Example from Bohol, Philippines", *Geografiska Annaler. Series B, Human Geography*, Vol 71(2): 95-108

Urich, P. (1995) *Resource Control and Environmental Change in the Philippines: A Case Study in the province of Bohol*, Unpublished PhD thesis, Australian National University

Urich, P. (2000) "Deforestation and declining irrigation in Bohol", *Philippine Quarterly of Culture and Society*, 28: 476-497

Urich, P. and M. Edgecombe (1999) "Bohol's Indigenous Social Institutions: A Development Perspective", *Philippine Quarterly of Culture and Society*, 27: 178-201

Urich, P., M.J. Day., and F. Lynagh (2001) "Policy and practice in karst landscape protection: Bohol, the Philippines", *The Geographical Journal*, Vol 67(4): 305-323

Vacek, L. (1998) *Conference Report: Supporting the Non-profit Sector in Asia*, Bangkok: Asia Pacific Philanthropy Consortium, quoted in, Moran, J. (1999) "Patterns of corruption and development in East Asia" *Third World Quarterly*, Vol 20, No 3: 569-587

Van der Fliert, E. (1993) *Integrated Pest Management: Farmer Field Schools Generate Sustainable Practices*, Wageningen Agricultural University Paper 93-3, WAU, The Netherlands, cited in Pretty, J. N. (1995) *Regenerating Agriculture*, London: Earthscan Publishers

Vandermeer, J., and I. Perfecto (1995) *Breakfast of biodiversity: The truth about rainforest destruction*, Oakland: Food First Books

Vandermeer, J.H. (1990) "Intercropping" in Carroll, C. R., Vandermeer, J.H., and P.M. Rosset (eds) *Agroecology*, New York: McGraw-Hill Publishing Company

Varela, A. (1995) "Different faces of Filipino Administrative Culture", in Tapales, P.M., and N.N. Pilar (eds) *Public Administration by the Year 2000: Looking Back into the Future*, Quezon City: College of Public Administration, University of the Philippines, quoted in, Quah, J.S.T. (1999) "Corruption in Asian Countries: Can it be Minimised?" *Public Administration Review*, November/December 1999, Vol 59, No. 6: 483-494

Vargas, D.S., Abon, M.G., Divina, C.C., and J.D. Bibal (1998) "Agricultural Development in Nueva Ecija: The Case Of Rajal Centro and Triala". Report for the ILEIA Research Program

Vaughan, D.A. and T.T. Chang (1992) "In-situ conservation of rice genetic resources." *Economic Botany,* 46 (4): 368-383

Warburton, H., Palis, F.G., and P.L. Pingali (1995) "Farmer perceptions, knowledge and pesticide use practices", in Pingali, P.L., and P.A Roger (eds) *Impact of Pesticides on Farmer Health and the Rice Environment,* Norwell, M.A: Kluwer Academic Publishers; and Los Banos, Philippines: International Rice Research Institute

Warren, D., Sikkerveer, J., and D. Brokensha (1991) *Indigenous Knowledge Systems: The Cultural Dimensions of Development,* London: Kegan Paul International

Way, M.J., and K.L. Heong (1994) "The role of diversity in the dynamics and management of insect pests of tropical irrigated rice – a review", *Bulletin of Entomological Research,* 84: 567-587

Weiner, J. (1990) "Plant population ecology in agriculture", in, Carroll, C. R., Vandermeer, J.H., and P.M. Rosset (eds) *Agroecology,* New York: McGraw-Hill Publishing Company

White, S.C. (1996) "Depoliticising development: the uses and abuses of participation", *Development in Practice,* Vol 6, No 1: 6-15

Williams, G. (2003) "Towards a Re-politicisation of Participatory Development: political capabilities and spaces of empowerment", *Conference on Participation: From Tyranny to Transformation,* Manchester, 27-28 February, 2003, electronic resource, retrieved from http://idpm.man.ac.uk/rsc/events/participation03/index.shtml, on 5/04/04

Williams, G., Veron, R., Corbridge, S., and M. Srivastava (2003) "Participation and Power: Poor peoples Engagement with the Indian Employment Assurance Scheme", *Development and Change,* 34(1)

Williamson, J. (1993) "Democracy and the 'Washington Consensus'", *World Development,* 21 (8): 1329-1336

Witcombe, J.R. and A. Joshi. (1997) "The Impact of Farmers Participatory Research on Biodiversity of Crops." Retrieved from http://www.idrc.ca/books/focus/833/witcombe.html on June 17, 2003

Wolters, W. (1984) *Politics, Patronage and Class Conflict in Central Luzon,* Quezon City: New Day Publishers, quoted in, Boyce, J.K. (1993) *The Political Economy of Growth and Impoverishment in the Marcos Era,* Manila: Ateneo de Manila University Press

Wood, S., K. Sebastian., and S.J. Scherr. (2000) "Pilot Analysis of Global Agroecosystems." Retrieved from www.wri.org/wri/wr2000/agroecosystems_page.html, on June 23, 2003

Woolcock, M. (1998) "Social Capital and Economic Development: Toward a Theoretical and Synthesis and Policy Framework", *Theory and Society*, 27: 151-208

Woolcock, M. (2001) *Social Capital, Civil Society and Poverty Reduction,* Research School of Social Sciences, Symposium Address, Australian National University, September, 3, 2001

Worthington, E. B. (1973) What is Human Ecology? In, P. Rogers (ed) *The Education of Human Ecologists*, London: Charles Knight

Wurfel, D. (1983) "The Development of Post-War Philippine Land Reform: Political and Sociological Explanations", in Ledesma, A,J., Makil, P.Q., and V.A. Miralao (eds) *Second View from the Paddy.* Manila: Institute of Philippine Culture, Ateneo de Manila University

Yap, E. (2000) *Farmer-Led Seed Breeding Technologies,* in, IIRR and ILEIA, *Enhancing sustainability of the rice economy in the Philippines.* Workshop Proceedings. International Institute for Rural Reconstruction, Y.C James Yen Centre, Silang, Cavite, Philippines and Centre for Information on Low External Input and Sustainable Agriculture, Leusden, The Netherlands

Yapa, L. (1993) "What are Improved Seeds? An Epistemology of the Green Revolution" *Economic Geography,* Volume 9, Issue 93: 254-273

Young, G.L. (1989) "A Conceptual Framework for an Interdisciplinary Human Ecology", *International Monographs in Human Ecology, No. 1, 1989,* Human Ecology Division, Department of History, University of Lund

Zeven, A.C. (1998) "Landraces: A Review of Definitions and Classifications." *Euphytica* 104: 127-139

Zhu, Y., Y. Wang., H. Chen., and B. Lu. (2003) "Conserving traditional rice Varieties through management for crop diversity" *BioScience* 53(2): 158-162

Appendix 1 - NVivo subject categories and conceptual nodes

Acquiring land

Agrarian reform

Ajon-ajon

ALAB

Baow

Barangay council

Bayanihan

Bid system

Bugasay

Campagao cooperative

Catholic Church

Couples for Christ

CFPRA

Cluster

Community saving

Comparison of yields

Corruption

Costs and prices

Credit

Farmer's criticisms

DA programs

Dayong

Dependence

Familial duty

Gala

History of Campagao

Informal land tenure

Information transmission

Kanaway

Kinaraan

Knowledge

Labour tasks

Labour demand

Labour sovereignty

Land fragmentation

Landowners behaviour

Methods of land preparation

Motivation

Nutrient management

Organic fertilisers

Paradigms

Patron – client ties

Pesticide use

Pest management

Politics

Protest

Purok

Ritual and belief

Social learning

Synchronicity

Technological change

Transitional examples

Trust

Types of inorganic fertiliser

Types of organic fertiliser

Water management